GE
Sensing & Inspection Technologies

Gas Analysis

XMO2-IDM

User's Manual

imagination at work

910-141 Rev. D
July 2009

XMO2-IDM

Panametrics Smart Oxygen Transmitter

User's Manual

910-141 Rev. D
July 2009

ATTENTION! This manual should be used only for XMO2 units with the IDM User Program (Option D = 3 or 4). For XMO2 units with the Terminal User Program (Option D = 1 or 2), manual number 910-141A must be used.

GESensingInspection.com

©2009 General Electric Company. All rights reserved.
Technical content subject to change without notice.

[no content intended for this page - proceed to next page]

Chapter 1. Features and Capabilities

1.1 Introduction 1
1.2 Basic Features 1
1.3 Theory of Operation 3
1.3.1 System Components 6
1.3.1a The XMO2 Transmitter 6
1.3.1b The Sample System 8
1.3.1c Long Cables (optional) 8
1.3.1d Power Supply (optional) 8
1.3.1e The TMO2D Display/Controller (optional) 8

Chapter 2. Installation

2.1 Introduction 9
2.2 Installing the XMO2 Transmitter 9
2.3 Installing the Sample System 10
2.3.1 A Basic System 10
2.3.0a Mounting the Sample System 11
2.3.1 Wiring the XMO2 Transmitter 12
2.3.2 CE Mark Requirements 12
2.3.3 Grounding the XMO2 Enclosure 12
2.3.4 Cable Specifications 13
2.3.5 Accessing Terminal Blocks TB1 and TB2 14
2.3.6 Wiring the Signal Connections 15
2.4 Establishing the RS232 Communication Link 16
2.5 Connecting to Other Devices 17
2.5.1 The PS5R-C24 Power Supply 17
2.5.2 TMO2D Display 18
2.5.3 LDP Display 18
2.5.4 XDP Display 18
2.5.5 Moisture Image/Monitor Series Analyzers 18
2.5.6 System 1 Analyzer 18

Chapter 3. Startup & Operation

3.1 Introduction 19
3.2 Powering Up the XMO2 Transmitter 19
3.3 Establishing a Sample Gas Flow 19
3.4 Analog Output Calibration Options 21
3.5 Factory Calibration Procedures 21
3.6 Enhancing the Factory Calibration 23
3.7 Required Calibration Materials 24
3.8 Preparing for Field Calibration 24
3.9 One-Gas Pushbutton Field Calibration 26
3.10 Two-Gas Pushbutton Field Calibration 27
3.10.1 Setup 27
3.10.2 Zero Gas Pushbutton Calibration 28
3.10.3 Span Gas Pushbutton Calibration 28
3.11 IDM Digital Communication Calibration 29
3.12 The Edit Functions Menu 30
3.13 The Field Cal Menu 31
3.13.1 Perform Cal 32
3.13.2 Configure Cal 33
3.13.2a Field Cal Type 33
3.13.2b Field Cal Percent 34
3.13.2c Before Delay Time 35
3.13.2d After Delay Time 35
3.13.2e Max Total Drift 36
3.13.2f Max Drift/Cal 36
3.13.3 Calibration Drifts 36
3.13.4 Clear Calibration 37
3.13.5 Hold Last Value 37
3.14 Changing the 4-20 mA Analog Output Range 38
3.14.1 4-20mA Range 39
3.14.2 4mA Cal 40
3.14.3 20 mA Cal 40
3.14.4 4-20mA Test 41
3.14.5 %O2 Test 41

Chapter 4. Programming with Instrument Data Manager

4.1 Introduction . . . 43
4.2 The Edit Functions Menu . . . 43
4.2.1 The Error Handler Menu . . . 44
4.2.2 Total Drift Error . . . 45
4.2.3 All Other Error Conditions . . . 46
4.3 The Factory Cal Menu . . . 47
4.3.1 Background Gas Labels . . . 47
4.3.2 Pressure Compensation . . . 48
4.3.2a Number of Pressures . . . 49
4.3.2b Pressure #1 Background Gases . . . 50
4.3.2c Completing the Process . . . 52
4.4 The Advanced Menu . . . 53
4.4.1 Fast Response . . . 54
4.4.2 Language . . . 55
4.4.3 Meter ID . . . 57

Chapter 5. Specifications

5.1 Performance . . . 59
5.2 Functional Specifications . . . 60
5.3 Physical Specifications . . . 61
5.4 Optional Accessories . . . 61
5.5 Ordering Information . . . 62
5.5.1 Calibration Specification . . . 63
5.6 A Calibration Sheet . . . 64

Appendix A. Two Typical Applications

A.1 Blanketing Gases in Hydrocarbon Liquid Storage Tanks . . . 65
A.1.1 The Problem . . . 65
A.1.2 Equipment Used . . . 65
A.1.3 Basic Operating Procedure . . . 66
A.1.4 Previous Systems . . . 66
A.2 Reactor Feed Gases in Formaldehyde Production . . . 67
A.2.1 The Problem . . . 67
A.2.2 Equipment Used . . . 67
A.2.3 Basic Operating Procedure . . . 68
A.2.4 Previous Systems . . . 68

Appendix B. Outline and Installation Drawings

Appendix C. IDM Menu Maps

Appendix D. Programming with PanaView

D.1 Introduction 89
D.2 Wiring the RS232 Interface 89
D.3 Setting Up the Communications Port 89
D.4 Adding the XMO2 91
D.5 Changing Meter Settings 93

Appendix E. CE Mark Compliance

E.1 CE Mark Requirements 97
E.2 EMI Filter Board 98
E.3 Wiring the Signal Connections 99

Typographical Conventions

- ***Note*** *paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.*
- ***Important*** *paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.*
- **Caution! paragraphs provide information that alerts the operator to a hazardous situation that can cause damage to property or equipment.**
- **Warning! paragraphs provide information that alerts the operator to a hazardous situation that can cause injury to personnel. Cautionary information is also included, when applicable.**

Safety Information

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

WARNING! Only personnel sufficiently trained in the use of the XMO2 and related equipment should be allowed operate it. All operators must fully know and understand the operating procedures and safety recommendations related to this equipment, as discussed in this manual.

WARNING! Cable entries of an approved flameproof design are required. These must be installed according to the manufacturer's instructions. The choice of cable entry device may limit the overall installation category achieved.

WARNING! It is the responsibility of the user to ensure that all cable entry devices and covers are properly installed and secure prior to applying power to the XMO2.

[no content intended for this page - proceed to next page]

Chapter 1. Features and Capabilities

1.1 Introduction

This chapter introduces you to the features and capabilities of the GE Sensing & Inspection Technologies *XMO2 Thermoparamagnetic Oxygen Transmitter.* The following specific topics are discussed:

- **Basic Features -** a brief discussion of the XMO2 Transmitter's basic features and capabilities
- **Theory of Operation -** details on the sensor's construction and how the measurements are made
- **System Components -** a description of the available XMO2 options and the required sample system

Note: *The XMO2 technical specifications and ordering information can be found in Chapter 5,* Specifications and Factory Data.

1.2 Basic Features

The XMO2 Transmitter measures the concentration of oxygen in the 0-100% range in a variety of gas mixtures, and it provides a 4-20 mA analog output signal that is proportional to the oxygen concentration. In performing these measurements, the microprocessor-based XMO2 provides automatic oxygen signal compensation for background gas composition and/or pressure variations. In addition, the XMO2 is equipped with *Fast-Response* software, real-time error detection, and push-button field calibration.

The XMO2 Transmitter offers several unique design features:

- Ultra-stable thermistors and a measuring cell that is temperature-controlled at 45°C (113°F) provide excellent zero and span stability, as well as a high tolerance to ambient temperature variations. Optional measurement cell operating temperatures of 60°C (140°F) and 70°C (158°F) are available for special applications.
- The measurement cell design is resistant to contamination and relatively tolerant of sample gas flow rate variations. As it has no moving parts, the XMO2 performs reliably under the shock and vibration found in many industrial applications.
- The XMO2's unique *"bridge-within-a-bridge"* measurement circuit and microprocessor-based operation automatically compensate the oxygen signal for variations in the magnetic and thermal properties of the background gas that would otherwise cause measurement errors.

1.2 Basic Features (cont.)

- At high oxygen concentrations, changes in atmospheric pressure have significant effects on the measured oxygen level. However, the XMO2 provides automatic microprocessor-based atmospheric pressure compensation of the oxygen signal for these applications.
- The XMO2's modular construction means that the unit can be field-calibrated quickly and easily. Also, the plug-in measuring cell can be replaced with a pre-calibrated spare in just minutes.
- The XMO2 Transmitter, which is available in weatherproof or explosion-proof packaging, is designed to be installed as close as possible to the process sample point. It can be located up to 450 ft (137 m) from the control system, display, or recorder using standard GE Sensing cables.
- An RS232 serial communications interface and a multi-level, menu-driven *User Program* provide a convenient means for calibrating and programming the XMO2
- Internal software algorithms along with user-programmed calibration data provide compensation of the oxygen signal for background gas composition, atmospheric pressure, or both background gas composition and atmospheric pressure.
- GE Sensing proprietary *Fast-Response* software provides enhanced response times to track rapidly changing processes.
- Sophisticated error-checking software with user-programmable defaults and error limits detects abnormal measurement conditions.
- Pushbutton adjustment of the 4-20 mA analog output zero and span values is a standard feature with the XMO2.
- A *drift calibration* routine provides automatic drift compensation for minor changes in the sensor calibration setting.
- Programmable recalibration is accomplished in the field via a computer interface, with no potentiometers to adjust.

1.3 Theory of Operation

The XMO2 measures the concentration of oxygen in a gas mixture by utilizing the unique paramagnetic properties of oxygen.

As its magnetic susceptibility is approximately 100 times greater than that of most other common gases, oxygen can be easily distinguished from these gases based on its behavior in a magnetic field. Also, oxygen's magnetic susceptibility varies inversely with temperature. Therefore, by carefully combining a magnetic field gradient and a temperature gradient within the XMO2 measuring cell, an oxygen-containing gas mixture can be made to flow along these gradients. This induced gas flow is known as a *magnetic wind*. The intensity of this magnetic wind depends on the concentration of oxygen in the gas mixture.

Figure 1 below shows a flow schematic for the XMO2 measuring cell. Permanent magnets within the cell create a magnetic field, while the cell temperature is controlled at 45°C (113°F) to maintain thermal equilibrium. In addition, the cell contains two pairs of highly-stable, glass-coated thermistors. One thermistor of each pair located inside the magnetic field and the other thermistor of each pair located outside the field. Because the thermistors are electrically heated, a temperature gradient is thus created within the magnetic field.

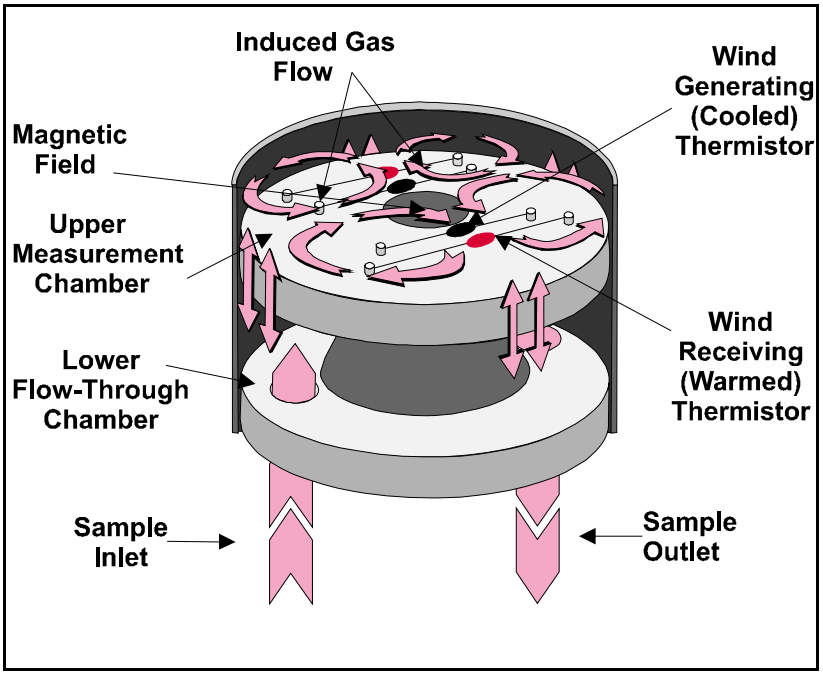


Figure 1: Measuring Cell Flow Schematic

1.3 Theory of Operation (cont.)

Figure 2 below shows the arrangement of the two thermistor pairs.

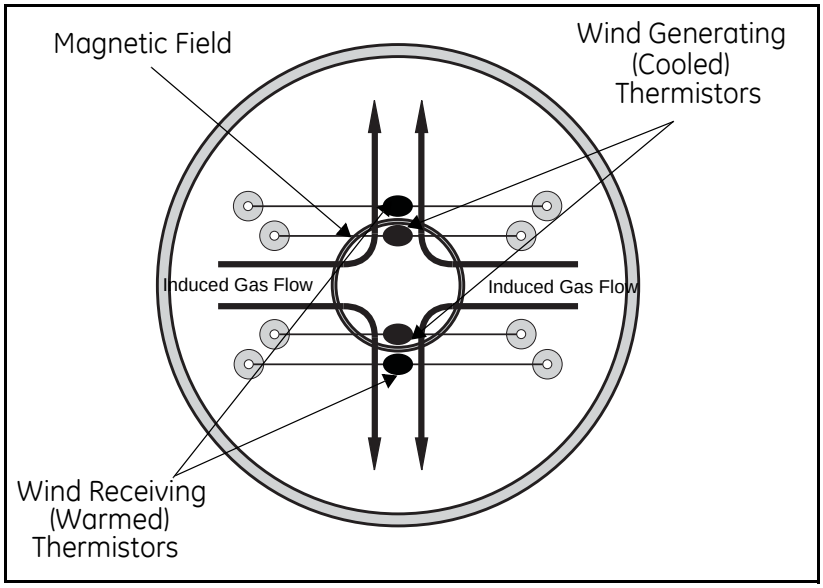


Figure 2: Arrangement of the Thermistor Pairs

A small portion of the sample gas flow is allowed to diffuse from the lower chamber into the upper chamber of the measurement cell. If the sample gas contains a paramagnetic gas such as oxygen, it is attracted to the magnetic field, causing the sample gas pressure to become locally higher in the center of the chamber. At the same time, the sample gas pressure is slightly lower near the thermistors because the high thermistor temperature causes the paramagnetic properties of oxygen to decrease. This slight gradient in sample gas pressure causes the sample gas to flow outward from the center of the magnetic field and over the thermistors. As a result, the inner, wind-generating thermistors decrease in temperature as they lose heat to the magnetic wind. This causes a temperature gradient between the cooler inner thermistors and the warmer outer thermistors.

Figure 3 on page 5 shows how the two thermistor pairs are connected in series in an electronic bridge circuit. The bridge circuit becomes unbalanced as the electrical resistance of the thermistors changes with temperature. This circuit imbalance causes a voltage drop, which is proportional to the oxygen concentration in the gas being measured, to appear across the bridge circuit.

Theory of Operation (cont.)

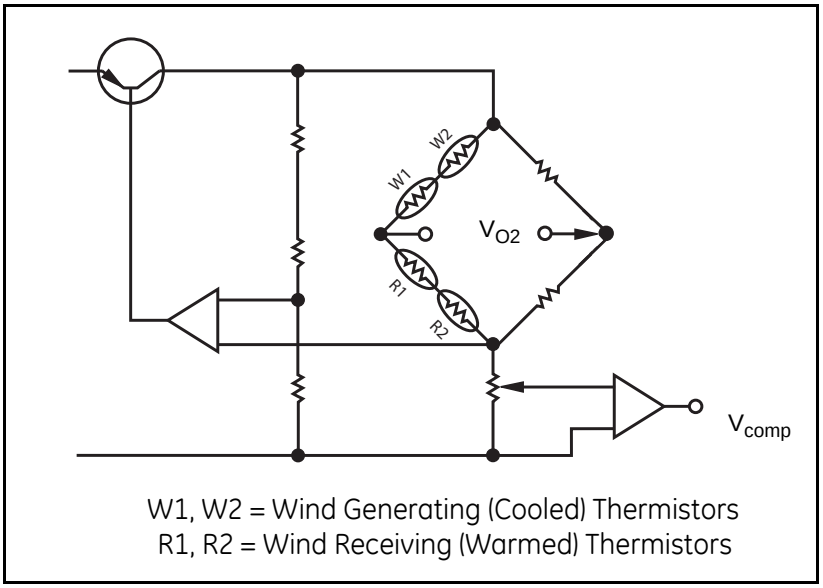


Figure 3: Thermistor Bridge Circuit

As the background gases that comprise the balance of an oxygen-containing gas mixture change, the magnetic and thermal properties of the gas mixture also change. This affects the accuracy and response of any paramagnetic oxygen analyzer. To compensate for such variations, the XMO2 has a unique *"bridge-within-a-bridge"* design.

The oxygen measuring bridge circuit described on the previous page is itself one arm of another compensation bridge circuit that maintains the oxygen bridge at a constant temperature as background gas composition changes. The electrical power change necessary to keep the oxygen bridge at constant temperature is a function of the thermal properties of the background gas. Therefore, this power fluctuation provides a signal that is related to the thermal conductivity of the background gas. That signal is then used to reduce the effects of the background gas variation on the oxygen span point measurement.

In addition to maintaining a constant oxygen bridge temperature, the XMO2 microprocessor compensates for any zero point shift in the oxygen bridge circuit output caused by background gas changes.

Finally, the bridge circuit voltage is further adjusted for variations in background gas composition and/or atmospheric pressure by internal, microprocessor-based compensation algorithms. The compensated signal is then amplified and converted to a 4-20 mA analog output that is proportional to the concentration of oxygen in the gas mixture.

1.3.1 System Components

The basic XMO2 measurement system consists of an *XMO2 Transmitter* mounted in a *Sample System*. The sample system is mandatory, and can either be provided by GE Sensing or constructed according to our recommendations.

1.3.1a The XMO2 Transmitter

The XMO2 Transmitter is self-contained, consisting of the oxygen sensor and associated electronics. It requires a 24 VDC power input @1.2 A maximum at power-up, and it provides a 4-20 mA analog output signal that is proportional to the oxygen concentration of the sample gas and has fully programmable zero and span points. Also provided is an RS232 digital output for oxygen concentration, background gas, and atmospheric pressure signals. Programming, and calibration of the unit may also be performed via this interface.

All XMO2 transmitters include a 10 ft (3 m), 4-conductor cable for connecting the power input and the 4-20 mA analog output. Optional XMO2 accessories available from GE Sensing include:

- power/analog output cable lengths of up to 450 ft (137 m)
- 24 VDC power supply (Model PS5R-C24)
- 3-conductor cable with a DB9 (male or female) or DB25 (male or female) connector for connecting the XMO2's RS232 digital output to external devices

The XMO2 is designed to be installed in a sample system as close as possible to the process sample point. Thus, it is available in two environmental packages:

- *Weatherproof:* NEMA-4X, IP66
- *Explosion-proof:* Class I, Groups A, B, C, D, Div. 1,
  Cenelec EEx d II C T6, with gas inlet and outlet flame arrestors

The XMO2 Transmitter, which is shown in Figure 4 on page 7, can be configured for the following standard oxygen ranges:

0 to 1%	0 to 25%
0 to 2%	0 to 50%*
0 to 5%	0 to 100%*
0 to 10%	80 to 100%*
0 to 21%	90 to 100%*

*****Pressure compensation is required

The XMO2 Transmitter (cont.)

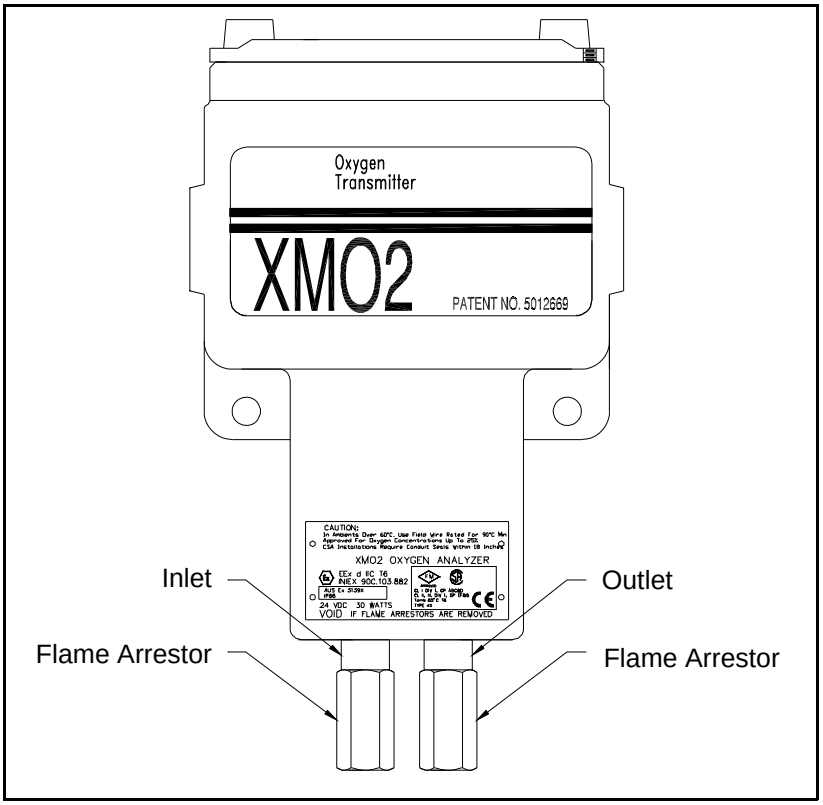


Figure 4: The XMO2 Transmitter

The standard XMO2 transmitter maintains the measurement cell at an operating temperature of 45°C (113°F). An optional 60° (140°F) or 70°C (158°F) cell operating temperature is available upon request.

Note: *The 60° (140°F) or 70°C (158°F) cell operating temperatures should be selected only when necessary, as the higher cell operating temperature results in reduced sensitivity.*

1.3.1b The Sample System

A sample system is mandatory for use with the XMO2 transmitter. The specific design of the sample system depends on the conditions of the sample gas and the requirements of the application. At a minimum, the sample system should include a sample gas flowmeter and a gas flow regulator valve.

In general, the sample system must deliver a clean, representative sample of the gas mixture to the XMO2 transmitter at a temperature, pressure, and flow rate that are within acceptable limits. The standard XMO2 transmitter sample gas conditions are as follows:

- -20° to +40°C (-4° to +104°F), at the standard measurement cell operating temperature of 45°C (113°F)
- atmospheric pressure
- 1.0 SCFH (500 cc/min) flow rate

GE Sensing offers sample systems for a wide variety of applications. A typical sample system for use with the XMO2 transmitter is shown in Chapter 2, *Installation*. For assistance in designing your own sample system, please consult the factory.

IMPORTANT: *ATEX compliance with EN 50104 requires both:*

- *Fast Response* calibration of the XMO2 transmitter
- *Pressure Compensation* of the XMO2 or constant control of the sample system pressure.

1.3.1c Long Cables (optional)

GE Sensing provides a standard 10 ft (3 m),
4-conductor, color-coded cable with each XMO2 to connect to the power input and the analog output. Optional cables are available in lengths up to 450 ft (137 m) as P/N X4(*), where * specifies the length in feet. For longer cables or to use your own cable, refer to Chapter 2, *Installation*, for recommendations.

1.3.1d Power Supply (optional)

The XMO2 requires 24 VDC input power at a maximum start-up current of 1.2 A. The GE Sensing PS5R-C24 power supply may be used to convert 100-240 VAC to the required 24 VDC.

1.3.1e The TMO2D Display/Controller (optional)

The GE Sensing *TMO2D Display/Controller* provides a two-line x 24-character back-lit LCD display for the XMO2's 4-20 mA analog output signal. It also permits display and option programming via its keyboard. Additional features include: recorder outputs, a real time clock, alarm relays, and relays for driving sample system solenoids for automatic zero and span calibration. For more information on the TMO2D, please consult the factory.

Chapter 2. Installation

2.1 Introduction

This chapter describes how to install the XMO2 transmitter and its sample system. It also contains information on connecting optional system components. Installation of the XMO2 system consists of three basic steps:

1. installing the XMO2 transmitter in the sample system (If you purchased your sample system from GE Sensing, this step has already been done for you.)
2. mounting, plumbing, and wiring the sample system
3. making wiring connections for power input, 4-20 mA analog output, RS232 digital output, and optional external devices

2.2 Installing the XMO2 Transmitter

Note: *This section applies only if the XMO2 transmitter has not already been installed in the sample system at the factory.*

The sample system must deliver a clean, representative gas sample to the XMO2 at the proper temperature, pressure and flow rate. This usually means a clean, dry gas sample that is free of solid and liquid particulates and is delivered at atmospheric pressure, a temperature no greater than 40°C (104°F), and a flow rate of approximately 1.0 SCFH (500 cc/min). A typical sample system for the XMO2 might include an inlet gas flow regulating needle valve, a sample gas flow meter, and a pressure gauge.

Note: *Because factory calibration of the XMO2 is done at atmospheric pressure and at a flow rate of 1.0 SCFH, operation of the XMO2 at other pressures and/or flow rates requires a field recalibration to ensure optimum accuracy.*

To install the XMO2 transmitter in the sample system, complete the following steps:

1. Select a location in the sample system that provides at least 9 in. (230 mm) of clearance above the top cover of the XMO2 for access to the interior of the transmitter's enclosure.
2. Mount the XMO2 transmitter in the sample system via its two mounting holes. Be sure that the transmitter is upright and is level to within ±15°.
3. Use 1/4" stainless steel tubing to connect the sample system *Inlet* and *Outlet* fittings to the corresponding XMO2 ports.

WARNING! For explosion-proof units, be sure to conform to all safety and electrical code requirements.

2.3 Installing the Sample System

You can order a complete sample system from GE Sensing & Inspection Technologies that is mounted on a steel panel and includes the XMO2 transmitter and all necessary components and plumbing. Several standard sample systems are available, and custom-designed sample systems can be built to your exact specifications.

2.3.1 A Basic System

Figure 5 below shows a basic sample system (dwg #732-164) that has been designed for use with the XMO2 transmitter.

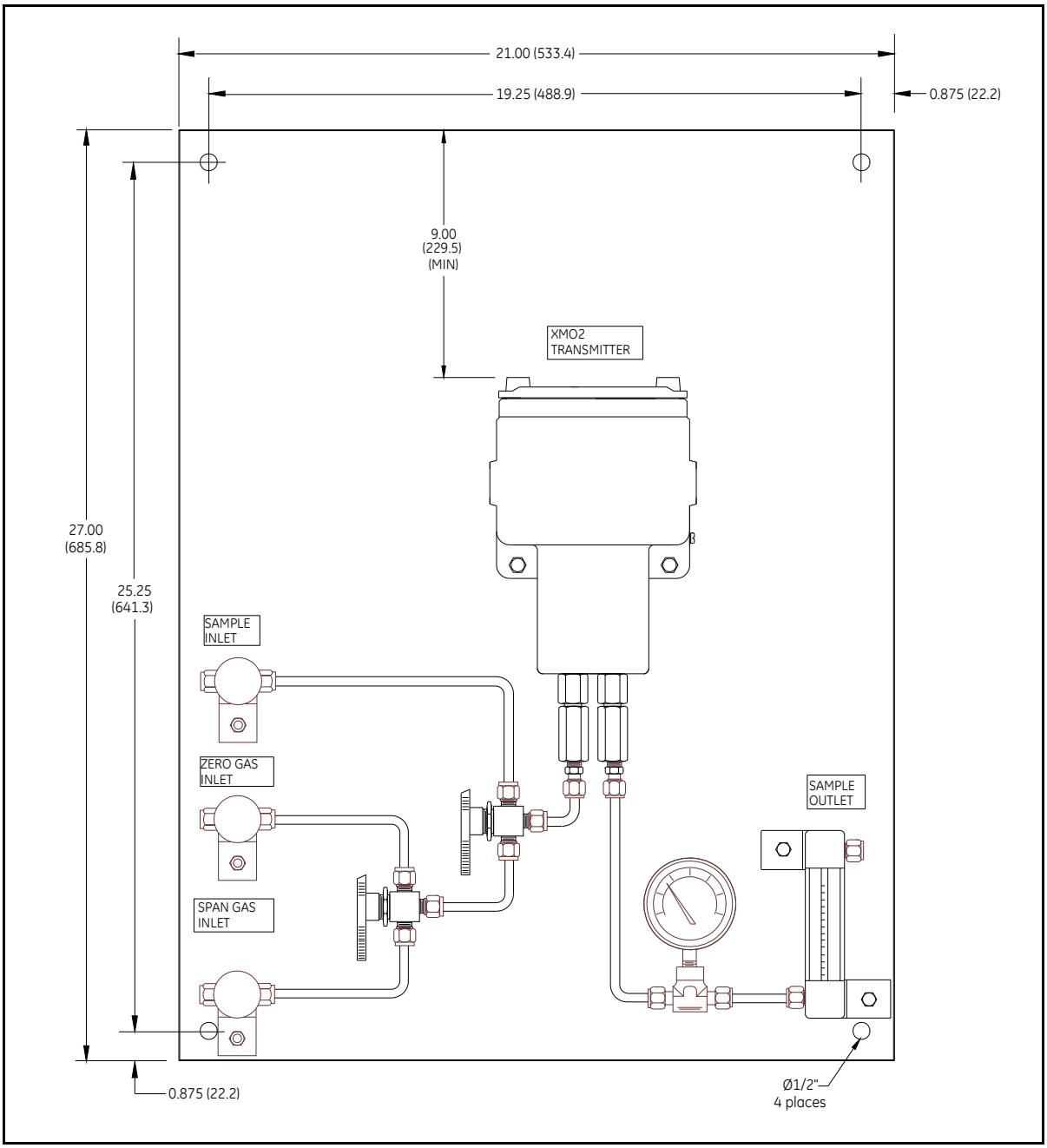


Figure 5: Basic XMO2 Sample System (ref. dwg #732-164)

2.3 A Basic System (cont.)

The sample system shown in Figure 5 on page 10 consists of a painted steel plate with the following components mounted on it:

- inlet needle valves for sample, zero, and span gas flow regulation
- ball valves for flow selection
- an XMO2 transmitter
- a sample gas outlet pressure gauge
- a sample gas flowmeter

Other components, such as a pump, a filter/coalescer, or a pressure regulator could be added to the system if needed.

2.3.0a Mounting the Sample System

To mount the sample system, complete the following steps:

1. Select a location that is as close as possible to the process sampling point. The ambient temperature at this location should be in the range of -20° to +40°C (-4° to +104°F).

IMPORTANT: *For locations where the ambient temperature falls below -20°C (-4°F), install the sample system in a heated enclosure.*

2. Using the mounting holes provided, fasten the sample system to a convenient vertical surface. The system must be installed in an orientation that keeps the XMO2 transmitter upright and level to within ±15°.

3. After the sample system has been mounted, use 1/4” stainless steel tubing to connect all inlet and outlet lines to the 1/4” tube fittings on the sample system. The sample line leading from the process to the sample system should be as short as possible in order to decrease system lag time and to prevent condensation in the line.

Proceed to the next section to begin wiring the system.

CAUTION! Always apply power to the XMO2 transmitter immediately after installation, especially if it is mounted outdoors or in a humid area.

2.3.1 Wiring the XMO2 Transmitter

This section describes how to make all necessary electrical connections to the XMO2 system.

2.3.2 CE Mark Requirements

ATTENTION EUROPEAN CUSTOMERS!
To meet CE Mark requirements, all electrical cables must be grounded and shielded as described in Appendix E.

2.3.3 Grounding the XMO2 Enclosure

WARNING! The XMO2 transmitter enclosure must be properly grounded.

Connect the external ground screw on the XMO2 enclosure (see *Figure 6* below) to a suitable earth ground.

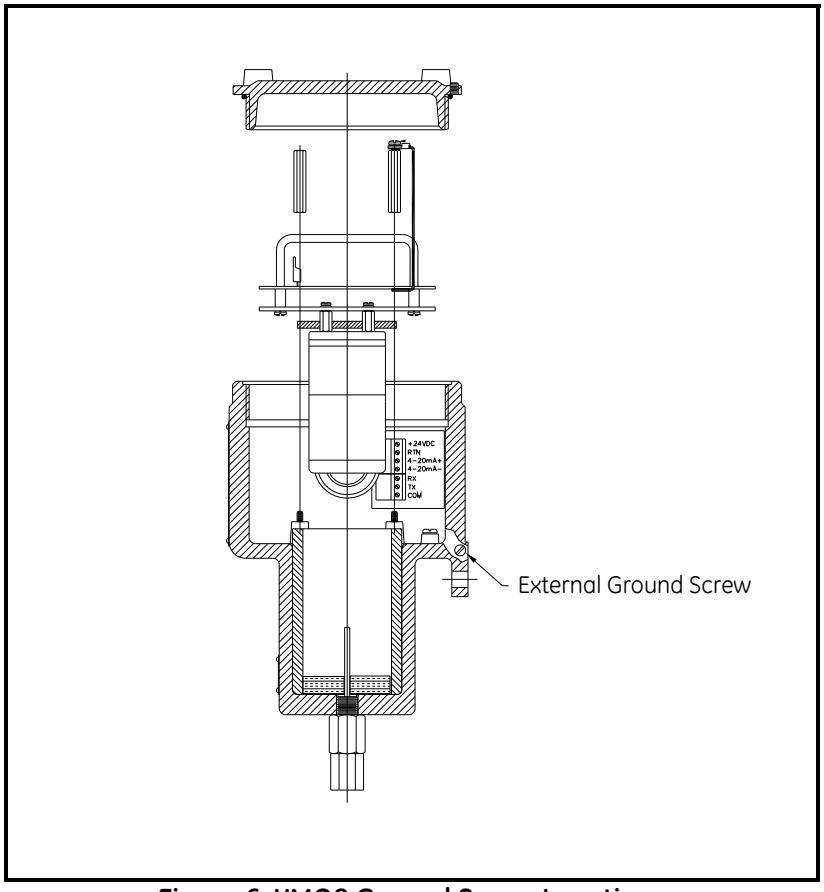


Figure 6: XMO2 Ground Screw Locations

2.3.4 Cable Specifications

Table 1 below shows the transmitter wiring connections using the standard GE Sensing & Inspection Technologies XMO2 4-wire cable [P/N X4(L), where L = length in ft]. This cable can be used for distances up to 450 ft (137 m).

Table 1: GE 4-Wire XMO2 Cable

Lead	Color	AWG	Terminal
+24 VDC Line	Red	22	TB1-1
24 VDC Return	Black	22	TB1-2
4-20 mA (+)	White	22	TB1-3
4-20 mA (-)	Green	22	TB1-4

If you are using your own cable to wire the XMO2, refer to Table 2 below for cable requirements.

Table 2: Non-GE Cable Requirements

MAX. CABLE LENGTH		WIRE SIZE	
ft	m	AWG	mm^2
450	130	22	0.35
700	200	20	0.60
1,050	320	18	1.00
1,700	500	16	1.20
2,800	850	14	2.00
4,000	1,200	12	3.00

Table 3 below shows the connections for the GE Sensing standard 3-wire RS232 cable (P/N 704-667, -668, -669, or -670-L, where L = length in ft), which is available with a DB-9 or a DB-25 connector (male or female). This cable is available in standard lengths of 6 ft and 12 ft.

Table 3: GE 3-Wire RS232 Cable

Lead	Color	AWG	Terminal
RX	Red	22	TB2-1
TX	White	22	TB2-2
GND	Green	22	TB2-3

See the *EIA-RS Serial Communications* booklet (GE Sensing document #916-054) for a more detailed discussion of RS232 wiring.

Note: *See Figure 64 in Appendix B for detailed drawings of the standard GE Sensing & Inspection Technologies cables described above.*

2.3.5 Accessing Terminal Blocks TB1 and TB2

The 24 VDC power input, 4-20 mA analog output, and RS232 digital output wiring connections are made to terminal blocks TB1 and TB2 inside the XMO2 enclosure (see Figure 7 below). To access this terminal block, loosen the locking set screw and remove the cover from the transmitter. Then, refer to Figure 7 below for the location and pin designations of terminal blocks TB1 and TB2.

CAUTION! Do not make any connections to any unused pins on terminal blocks TB1 or TB2.

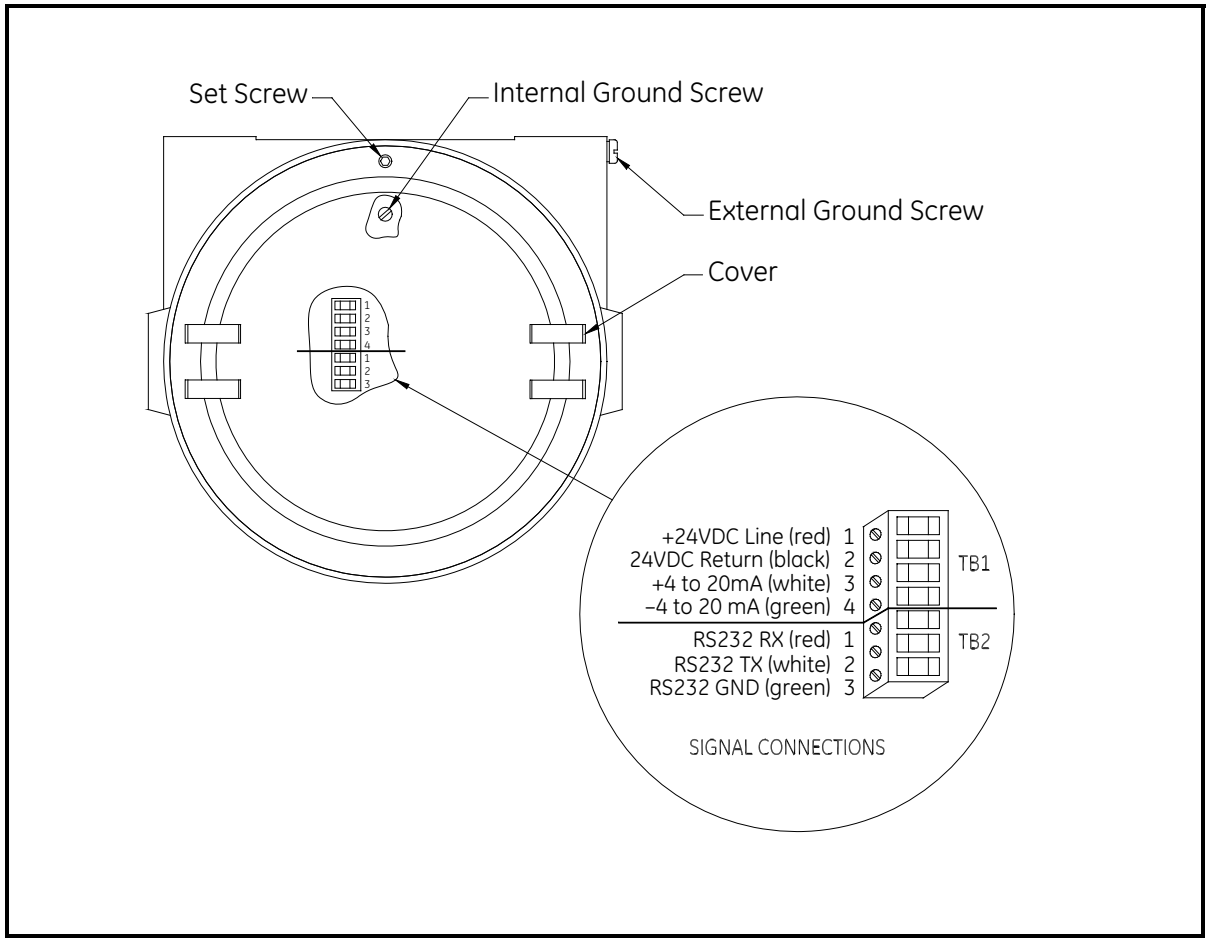


Figure 7: TB1 and TB2 Terminal Block Connections

Proceed to the next section to begin making connections to terminal blocks TB1 and TB2.

2.3.6 Wiring the Signal Connections

Complete the following steps to make the signal connections to terminal blocks TB1 and TB2:

1. Install a cable clamp or gland in one of the 3/4" conduit holes.

CAUTION! Be sure to plug the unused conduit hole to maintain the designated weatherproof or explosion-proof rating.

2. Route the 4-wire and 3-wire (if used) cables through the cable clamp. Then, tighten the clamp to secure the cable(s).

3. Unplug the TB1 and TB2 connectors by pulling them straight off the printed circuit board, and loosen the screws on the side of the connectors.

4. Connect the 24 VDC input power leads as follows:

CAUTION! Connecting the +24 VDC (red) lead to any terminal except TB1-1 will damage the XMO2.

- **a.** Insert the 4-wire cable +24 VDC line (red) lead into pin TB1-1 and tighten the screw.
- **b.** Insert the 4-wire cable 24 VDC return (black) lead into pin TB1-2 and tighten the screw.

5. Connect the 4-20 mA analog output leads as follows:

- **a.** Insert the 4-wire cable + 4-20 mA (white) lead into pin TB1-3 and tighten the screw.
- **b.** Insert the 4-wire cable – 4-20 mA (green) lead into pin TB1-4 and tighten the screw.

6. Connect the optional RS232 digital output leads as follows:

- **a.** Insert the 3-wire cable RX (red) lead into pin TB2-1 and tighten the screw.
- **b.** Insert the 3-wire cable TX (white) lead into pin TB2-2 and tighten the screw.
- **c.** Insert the 3-wire cable GND (green) lead into pin TB2-3 and tighten the screw.

7. Carefully plug the TB1 and TB2 connectors back onto the printed circuit board, and reinstall the cover on the XMO2.

8. Connect the other ends of the cables to the 24 VDC power supply, the 4-20 mA input of the display/control device, and the serial port of the computer or terminal (see the instruction manuals for those devices for details).

2.4 Establishing the RS232 Communication Link

Before the XMO2 can be programmed, a link between the built-in RS232 digital output and a computer terminal must be established. To accomplish this, proceed as follows:

Note: *See GE Sensing & Inspection Technologies brochure* EIA-RS Serial Communications *(916-054) for a detailed discussion of the RS232 standard.*

1. Verify that either Com 1 or Com 2 on the computer is unused.

IMPORTANT: *Do not use a virtual Com port, such as Com 3 or Com 4, for communicating with the XMO2.*

2. With both the XMO2 and the computer turned off, connect a serial cable from the XMO2 to the PC. See Chapter 2, *Installation*, for detailed instructions.

CAUTION! Never make any connections to a computer while it is powered up. Damage to the system may result.

3. Power up the PC and launch IDM.

Note: *See the IDM* User's Manual *(910-185) for information on installing and launching your program.*

4. In the *Global* menu of IDM, select the *Preferences* option to specify the com port to which your XMO2 has been connected.

5. For proper communications with the XMO2, the following com port settings must be specified:

- Baud Rate = 9600
- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Flow Control = Xon/Xoff

6. Select the *Connect to a New Instrument* option, enter the XMO2's ID number (1 to 254), and select *OK*.

2.5 Connecting to Other Devices

This section discusses interconnection of the XMO2 transmitter with other GE Sensing devices. The following devices are included:

- PS5R-C24 power supply
- TMO2D display
- LDP display
- XDP display
- Moisture Image/Monitor Series analyzers
- System 1 moisture analyzer

2.5.1 The PS5R-C24 Power Supply

The GE Sensing PS5R-C24 power supply converts a 100-240 VAC input to the required 24 VDC output. Figure 8 below shows the PS5R-C24 connections. As indicated, the AC input *Line*, *Neutral* and *Ground* connections are made to the terminals along the bottom of the panel, while the DC output *+24V line* and *24V return* connections are made to the terminals along the top of the panel. See the instructions provided with the power supply for more details.

Figure 8: PS5R-C24 Power Supply Connections

2.5.2 TMO2D Display

The GE Sensing TMO2D display provides a two-line x 24 character back-lit LCD. It features display and option programming via the keyboard and it offers recorder outputs, alarm relays, and optional relays for driving sample system solenoids for automatic zero and span calibration of the XMO2. See Figure 63 in Appendix B for an interconnection diagram, and refer to the TMO2D *User's Manual* (910-084) for details on its operation.

2.5.3 LDP Display

The LDP display provides an integral, regulated 24 VDC power supply, an adjustable 3-digit display to program the 4-20 mA analog input range, two programmable SPDT alarm relays rated for 1A @250 VAC, and an isolated, independently-adjustable 4-20 mA analog output. The LDP is supplied in an explosion-proof enclosure that is rated for Cenelec EEx d IIC T6 and IP66 (with an optional gasket). See Figure 63 in Appendix B for an interconnection diagram, and refer to the LDP *User's Manual* (910-225) for details on its operation.

2.5.4 XDP Display

The XDP Explosion-proof Display Package provides an integral, regulated 24 VDC power supply, a 3-digit display with an adjustable 4-20 mA analog input range, two SPDT alarm relays rated for 1A @250 VAC, and an isolated, independently-adjustable 4-20 mA analog output. The XDP is supplied in an explosion-proof enclosure that is rated for Cenelec EEx d IIC T6 (approval pending) and IP66 (with optional gasket). See Figure 63 in Appendix B for an interconnection diagram, and refer to the XDP *User's Manual* (910-204) for details on its operation.

2.5.5 Moisture Image/Monitor Series Analyzers

These GE Sensing instruments include the Moisture Image Series 1 and Moisture Monitor Series 3 analyzers. These analyzers accept inputs from a variety of sensors (including the XMO2) and offer graphical and digital interfaces. See Figure 63 in Appendix B for interconnection diagrams, and refer to the *User's Manual* (910-108 or 110) for details on its operation.

Note: *An external 24 VDC power supply (such as the PS5R-C24) is required to use the XMO2 with these analyzers.*

2.5.6 System 1 Analyzer

The GE Sensing System 1 is a versatile multi-channel analyzer which accepts inputs from any combination of GE Sensing moisture, temperature, oxygen, and thermal conductivity transmitters. See Figure 63 in Appendix B for an interconnection diagram, and refer to the System 1 *User's Manual* (900-019) for details on its operation.

Note: *An external 24 VDC power supply (such as the PS5R-C24) is required to use the XMO2 with the System 1 analyzer.*

Chapter 3. Startup & Operation

3.1 Introduction

This chapter provides instructions for starting up and operating the XMO2 system. The following specific topics discussed:

- powering up the XMO2 transmitter
- establishing a sample gas flow
- calibration of the analog output signal

If you have not already done so, please read Chapter 2, *Installation*, for details on mounting and wiring the XMO2 transmitter, the sample system, and any other optional equipment.

3.2 Powering Up the XMO2 Transmitter

The XMO2 transmitter does not have a power switch. It begins taking measurements and generating an analog output signal in the 0-25 mA range as soon as it is connected to a 24 VDC power source. To power up the system, simply energize the 24 VDC power supply.

Because the standard XMO2 measurement cell is controlled at a constant 45°C (113°F) operating temperature, allow at least 30 minutes for the unit to warm up and reach temperature stability before taking any measurements. During this time, you can establish a sample gas flow through the system, as described in the next section.

3.3 Establishing a Sample Gas Flow

Usually, the XMO2 transmitter is factory-calibrated at a sample gas flow rate of 1.0 SCFH (500 cc/min) and at atmospheric pressure. Unless otherwise specified on your XMO2 calibration sheet, optional sample system tagging, or optional sample system instructions, your XMO2 should be operated at atmospheric pressure and at the flow rate listed in Table 4 below.

Table 4: Recommended Sample Gas Flow Rates

XMO2 Type	Flow Rate in SCFH (cc/min)
Weatherproof	1.0 ± 0.5 (500 ± 250)
Explosion-proof	1.0 ± 0.2 (500 ± 100)
Pressure-compensated	0.5 ± 0.5 (250 ± 50)

Note: *For optimum performance, operating the XMO2 at conditions other than those used for the factory calibration requires that the unit be recalibrated at the actual field conditions.*

3.3 Establishing a Sample Gas Flow (cont.)

To establish a flow of sample gas through the system, complete the following steps (see Figure 5 on page 10 as an example):

1. Set the sample system ball valves to direct only the sample inlet stream to the inlet port of the XMO2 transmitter.
2. Use the sample inlet needle valve to regulate the flow of sample gas until the flowmeter reads the same flow rate listed for your unit in Table 4 on page 19.
3. Read the resulting system pressure on the pressure gauge. Make sure that there are no unnecessary flow restrictions downstream of the sample system.

IMPORTANT: *For atmospheric pressure-compensated units, the XMO2 outlet port must be vented directly to atmosphere with no restrictions, by installing all sample system components and tubing upstream of the XMO2 transmitter.*

4. Take a reading of the XMO2 4-20 mA analog output.

In some applications, pressure changes due to flow rate changes can cause noticeable errors in the oxygen measurement. In such cases, consider the following corrective measures:

- Reducing the flow rate to the minimum recommended value minimizes flow rate sensitivity. A bypass flow type sample system (speed loop) allows minimum flow through the XMO2 yet maintains a fast transport of the sample gas to the XMO2.
- For the fastest transport, minimize the sample line length from the process.
- If you cannot shorten the sample line length, reduce the sample line pressure to less than 5 psig.

Proceed to the next section to complete the initial XMO2 startup.

3.4 Analog Output Calibration Options

The XMO2 4-20 mA analog output has been calibrated at the factory for the oxygen range indicated on the XMO2 *Calibration Sheet* shipped with the unit. (Figure 9 on page 22 shows a typical calibration sheet.) Upon initial startup, field verification and/or calibration of the 4-20 mA analog output is required. To perform this task, either of the following procedures may be used:

- pushbutton calibration (offset gas method)
- IDM digital communication calibration (zero/span gas method)

This section provides information on calibrating the XMO2 in the field using either a one-gas (offset gas) method or a two-gas (zero gas and span gas) method. The following specific topics are discussed:

- factory calibration procedures
- updating the factory calibration
- required calibration materials
- Getting the XMO2 ready and locating the calibration switches.
- How to perform a one-gas (Offset Gas) or two-gas (Zero and Span Gas) Pushbutton calibration.
- How to perform an IDM digital communication calibration.

After the XMO2 is in operation, field calibration is recommended at intervals of about 1-3 months, depending on the application.

3.5 Factory Calibration Procedures

Prior to shipment, your XMO2 was calibrated at the factory for the $\%O_2$ range specified at the time of purchase. The following standard $\%O_2$ ranges are available:

• 0 to 1%	• 0 to 25%
• 0 to 2%	• 0 to 50%*
• 0 to 5%	• 0 to 100%*
• 0 to 10%	• 80 to 100%*
• 0 to 21%	• 90 to 100%*

* Pressure compensation is required

In addition, your XMO2 was calibrated at the factory for the compensation signal specified at the time of purchase. The following standard compensation signals are provided:

- *Background Gas Compensation* - the standard factory calibration uses N_2 and CO_2 as the background gases.
- *Pressure Compensation* - the standard factory calibration is for atmospheric pressure (700-800 mm of Hg).

Note: *Compensation signals are available for special background gases and/or special pressure ranges. For availability, pricing, and delivery, please consult the factory.*

3.5 Factory Calibration Procedures (cont.)

GE Sensing

XMO2 Calibration Sheet

XMO2 S/N:	3389
XMO2 Part Number:	XMO2-2H-11
Calibration Part Number:	XCAL-511
Compensation Type:	Background Gas N2/CO2
Calibration Range %O2:	0 to 21%
Work Order Number:	501010060853
Calibration Date:	February 15, 2009
Technician:	K. Brin

XMO2 Calibration Data

XMO2 Enable Compensation	Yes/Background
XMO2 System Response	Damped
XMO2 Oxygen Grid	4 Points, 2 Curves
XMO2 Recorder	4 to 20 mA 0 to 21% O2

Curve 1: in Nitrogen

PT	%O2	O2 (mV)	Comp (mV)	O2 Output (mA)
1	0.00	-402.9	243.3	4.00
2	10.00	-182.7	243.7	11.62
3	20.00	-3.9	244.1	19.24
4	20.93	13.7	244.2	19.95

Curve 2: in Carbon Dioxide

PT	%O2	O2 (mV)	Comp (mV)	O2 Output (mA)
1	0.00	-390.6	220.6	4.00
2	10.00	-40.5	223.2	11.62
3	20.00	214.0	226.7	19.24
4	20.93	237.7	227.0	19.95

Jumper on P6: Pins Not Used R24 = N/A
Field Calibration: 0% O2, push CAL button and hold for about 20 seconds

Figure 9: Sample Calibration Sheet

3.6 Enhancing the Factory Calibration

When your XMO2 transmitter was calibrated at the factory, the actual factory calibration data points were entered into the XMO2 software. If requested on the original order, calibration data points for expected field background gas composition and/or measurement cell pressure variations may also have been entered. To supplement this factory calibration data, calibration data points generated in the field for these parameters can be added into the XMO2 software.

The factory calibration can be further enhanced by performing periodic recalibrations in the field. The XMO2 then uses the new calibration data to create *offset* and *drift curves* that compensate the original factory calibration data for variations that occur in the field.

When making a measurement, the XMO2 uses the *Offset Curve* or *Drift Curve*, along with any background gas and/or cell pressure compensation data, entered at the factory or in the field, to update the factory calibration data.

To maintain the integrity of this process, the XMO2 should be recalibrated periodically. This is typically done every 1-3 months with a single (offset) calibration gas, depending on the application. The optimum recalibration interval depends on such factors as $\%O_2$ range, required accuracy, components of the gas mixture, the cleanliness of the sample gas, etc. In addition, the XMO2 should be recalibrated with the two-gas (zero gas and span gas) method at least once per year. Again, the optimum calibration interval depends on the specific application.

Using the calibration procedures in this chapter, the XMO2 can be recalibrated for the same $\%O_2$ range, background gas mixture, and compensation signals used for the factory calibration. However, if it has been some time since the original factory calibration, or if you want to calibrate the XMO2 for a different $\%O_2$ range, gas mixture, or compensation signal, contact the factory for instructions.

CAUTION! The calibration procedures described in this chapter require the use of specialized apparatus and should be performed only by properly trained service personnel, following all applicable safety practices.

3.7 Required Calibration Materials

To perform a field calibration, the following materials are required:

- offset gas - for a one-gas $\%O_2$ calibration
- zero gas - for a two-gas $\%O_2$ calibration and/or a 4-20 mA analog output calibration
- span gas - for a two-gas $\%O_2$ calibration and/or a 4-20 mA analog output calibration

Note: *Suggestions for suitable calibration gases are listed on the XMO2* Calibration Sheet *provided with your unit. Also, be aware that the accuracy of the calibration will only be as good as the accuracy of the calibration gas(es) used.*

- GE Sensing XMO2 *Calibration Sheet*
- a *sample system* or individual components (e.g. flowmeter, needle valve, pressure gauge, etc.) for introducing the calibration gas(es) to the XMO2 transmitter at the required pressure and flow rate. See Chapter 2, *Installation*, for specific recommendations.
- a multimeter/ammeter (for a 4-20 mA analog output calibration)

WARNING! Avoid using explosive gas mixtures as your XMO2 calibration gas(es).

3.8 Preparing for Field Calibration

To prepare the XMO2 for a field calibration, refer to Figure 10 on page 25 and perform the following preliminary steps:

1. Turn the power on and allow at least 30 minutes for the XMO2 to reach temperature stability.

2. Loosen the set screw that locks the XMO2 cover in place, and unscrew the cover.

IMPORTANT: *Remember to replace the cover after the field calibration has been completed.*

3. Refer to Figure 11 on page 25, and locate the following items:

- calibration pushbutton (Switch S3)
- zero/span selector (Switch S1)
- terminal block TB1

Note: *If you plan to perform the field calibration at a computer terminal via the XMO2's RS232 digital output, you do not need to access the above items. Skip Steps 1-2 above.*

Preparing for Field Calibration (cont.)

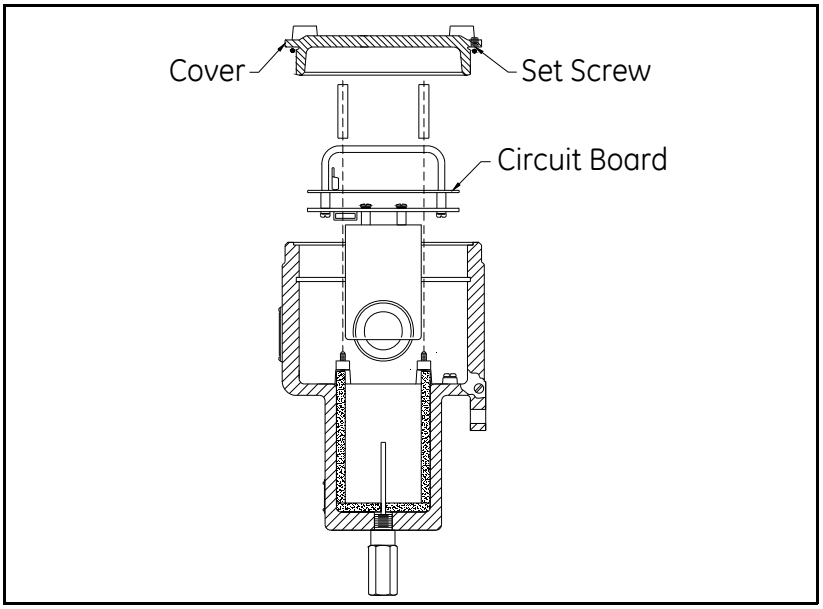


Figure 10: XMO2 Cover, Set Screw, and PCB

Note: *The XMO2's digital printed circuit board (PCB #703-1316) is located directly below the cover (see Figure 10 above).*

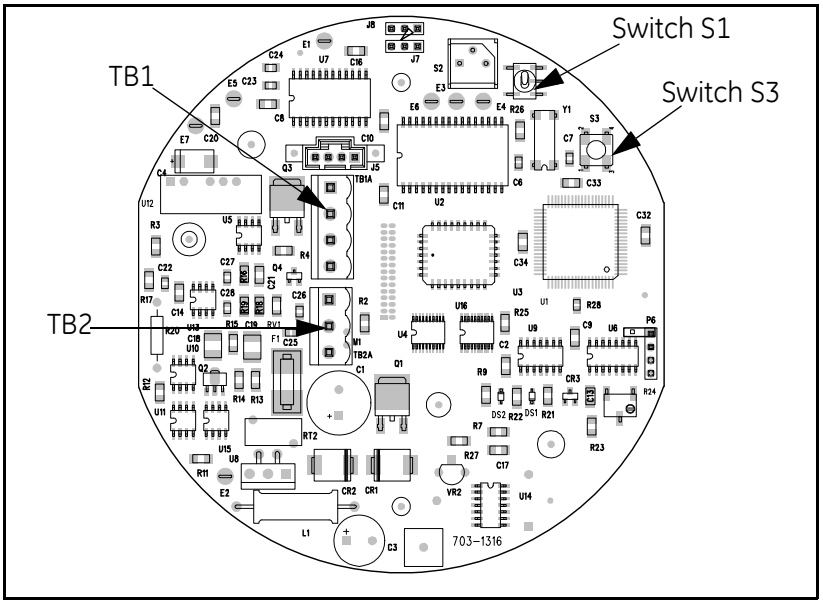


Figure 11: PCB #703-1316 Calibration Switches

CAUTION! Switch S2, jumper P6, potentiometer R24, and potentiometer R25 are also located on the XMO2 circuit boards. However, these items are <u>not</u> used for normal field calibration. Never touch these items unless specifically instructed to do so by GE Sensing.

3.9 One-Gas Pushbutton Field Calibration

This simplified field calibration procedure uses a single (offset) gas to recalibrate the XMO2. Then, the XMO2 compares the data from this field recalibration to the original factory calibration data, and stores the difference as an *Offset Curve*.

The XMO2 is usually factory-programmed for the offset gas pushbutton calibration method. The *Calibration Sheet* shipped with your unit specifies the recommended oxygen level (in $\%O_2$) for the offset gas to be used. This is the same offset gas oxygen level that was used for the factory calibration. If no offset gas $\%O_2$ is specified on the XMO2 Calibration Sheet, the factory calibration was done with 100% N_2 (0.00 $\%O_2$) and the field calibration should use the same offset gas.

To perform a pushbutton offset gas field calibration, complete the following steps:

1. Verify that your XMO2 is configured for a one-gas calibration. This is the factory default configuration for all units.
2. Using the sample system controls, stop the flow of sample gas to the XMO2 inlet port and initiate a flow of the same offset gas specified on the XMO2 Calibration Sheet. Establish the same flow rate and pressure conditions used for the sample gas, and allow the offset gas to flow through the XMO2 for at least three minutes.
3. Using Figure 11 on page 25 as a guide, locate the *Calibration Pushbutton* (Switch S3). Depress the *Calibration Pushbutton* and hold it down for 20 seconds. During this time, the green light below the *Calibration Pushbutton* will go out.
4. When the *Calibration Pushbutton* is released, the green light will come back on and the XMO2 has been recalibrated.

You may now return the XMO2 to normal operation by using the sample system controls to stop the offset gas flow and restart the flow of sample gas.

3.10 Two-Gas Pushbutton Field Calibration

This simplified field calibration procedure uses two (zero and span) gases to recalibrate the XMO2. Then, the XMO2 compares the data from this field recalibration to the original factory calibration data, and stores the difference as a *Drift Curve*.

Note: *If the range of your XMO2 is 0 to 21% O_2, you can use air as the span gas.*

3.10.1 Setup

Before proceeding, you must be sure that your XMO2 is configured for a two-gas calibration. The required reprogramming must be done via the IDM communication link, as follows:

1. Launch IDM.
2. From the Instrument window, pull down the *Edit Functions* menu, as shown in Figure 12 on page 30.
3. Click on the *Field Cal* option. In the *Field Cal* window (shown in Figure 13 on page 31), click on the *Configure Cal* button.
4. In the *Configure Cal* window (shown in Figure 17 on page 33), click on the *Field Cal Type* button.
5. In the *Field Cal Type* window (shown in Figure 18 on page 33), click on either the 1-Point or 2-Point button. Then, click on any button on the right to return to the *Configure Cal* window.

Note: *The zero and span calibrations can be performed in either order. For zero-based calibration ranges (e.g. 0-25%), we recommend performing the span calibration first. For non-zero-based calibration ranges (e.g. 90-100%), we recommend performing the zero calibration first.*

Proceed to the appropriate section to begin the field calibration.

3.10.2 Zero Gas Pushbutton Calibration

To perform a zero gas pushbutton field calibration, complete the following steps:

1. Using the sample system controls, stop the flow of sample gas to the XMO2 inlet port and initiate a flow of the same zero gas specified on the XMO2 Calibration Sheet. Establish the same flow rate and pressure conditions used for the sample gas, and allow the zero gas to flow through the XMO2 for at least three minutes.
2. Using Figure 11 on page 25 as a guide, locate the *Zero/Span Selector* (Switch S1). Set the *Zero/Span Selector* (Switch S1) to position “1" (“Zero”).
3. Using Figure 11 on page 25 as a guide, locate the *Calibration Pushbutton* (Switch S3). Depress the *Calibration Pushbutton* and hold it down for 20 seconds. During this time, the green light below the Calibration Pushbutton will go out.
4. When the *Calibration Pushbutton* is released, the green light will come back on and the XMO2 has been recalibrated. Verify that the mA reading on the ammeter is now equal to the expected value.

IMPORTANT: *If the XMO2 fails to recalibrate to the correct analog output value, contact the factory for assistance.*

3.10.3 Span Gas Pushbutton Calibration

To perform a span gas pushbutton field calibration, complete the following steps:

1. Using the sample system controls, stop the flow of sample gas to the XMO2 inlet port and initiate a flow of the same span gas specified on the XMO2 Calibration Sheet. Establish the same flow rate and pressure conditions used for the sample gas, and allow the span gas to flow through the XMO2 for at least three minutes.
2. Using Figure 11 on page 25 as a guide, locate the *Zero/Span Selector* (Switch S1). Set the *Zero/Span Selector* (Switch S1) to position “3" (“Span”).
3. Using Figure 11 on page 25 as a guide, locate the *Calibration Pushbutton* (Switch S3). Depress the *Calibration Pushbutton* and hold it down for 20 seconds. During this time, the green light below the *Calibration Pushbutton* will go out.
4. When the *Calibration Pushbutton* is released, the green light will come back on and the XMO2 has been recalibrated.

You may now return the XMO2 to normal operation by using the sample system controls to stop the span gas flow and restart the flow of sample gas.

3.11 IDM Digital Communication Calibration

At the initial startup of the XMO2, *IDM Digital Communication Calibration* is the second method available for field verification/calibration of the 4-20 mA analog output.

Note: *IDM can also be used to change the 4-20 mA analog output range. See the next section for details.*

To prepare for this calibration method, refer to Figure 10 on page 25 and perform the following preliminary steps:

1. Make sure that the RS232 digital output of the XMO2 has been connected to a computer or terminal in accordance with the instructions given in Chapter 2, *Installation*.

2. Loosen the set screw that locks the XMO2 cover in place, and unscrew the cover.

IMPORTANT: *Remember to replace the cover after the calibration has been completed.*

3. Turn the computer or terminal on and launch IDM.

Note: *Be sure you have properly installed Instrument Data Manager on your PC before attempting to program the XMO2.*

3.12 The *Edit Functions* Menu

To access the XMO2 calibration, you must pull down the *Edit Functions* menu from the Instrument window.The menu consists of the five commands displayed in Figure 12 below. To access any of the commands, simply select it from the menu.

Note: *As a programming aid, the relevant portions of the* Edit Functions *menu have been mapped in Figure 74 on page 87 and Figure 75 on page 88 in Appendix C.*

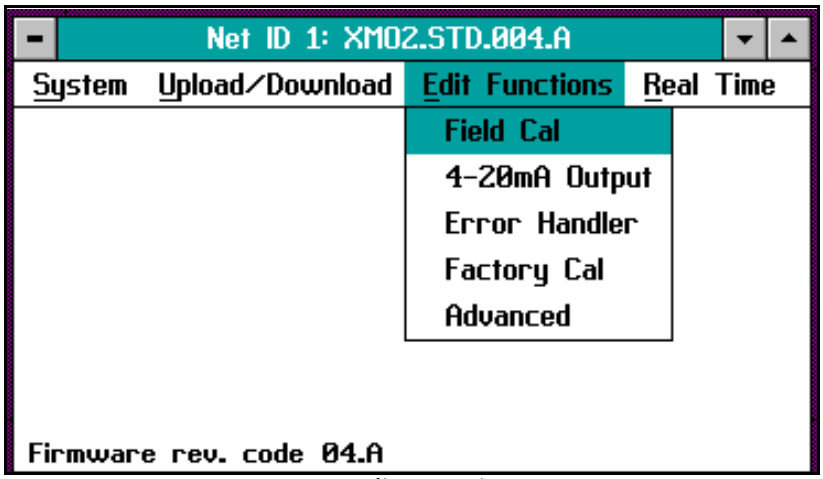


Figure 12: *Edit Functions* Menu

The following three buttons appear at the right of all menu windows (see Figure 13 on page 31):

- *Previous Item* - returns you to the previous window (either the command menu or the previous parameter entered).
- *Next Item/Enter* - confirms the selection or data entered, and either opens the next window or returns you to the command menu (depending on your position in the program).
- *Exit Page* - returns you to the command menu.

3.13 The *Field Cal* Menu

When you select the *Field Cal* option, a window similar to the one in Figure 13 below opens.

IMPORTANT: *The instructions in this section assume that the factory-programmed 2-Gas calibration method is still selected. If you have previously changed this to the 1-Gas calibration method, any windows that show* Zero *and* Span *calibration gas buttons are replaced with a window that shows just the single* Offset *calibration gas button.*

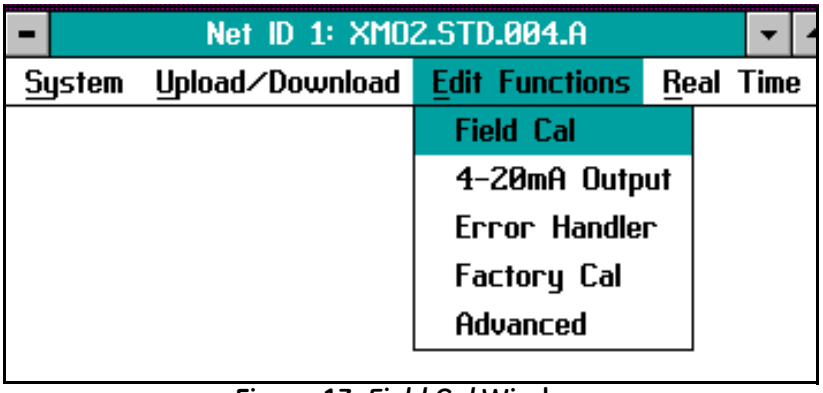


Figure 13: *Field Cal* Window

The *Field Cal* option offers the following five choices:

- *Perform Cal* - calibrates the XMO2
- *Configure Cal* - sets the calibration type and parameters
- *Calibration Drifts* - lists drift percentages for zero and span gases
- *Clear Calibration* - clears the last calibration
- *Hold Last Value* - holds the last value calibrated

Note: *Clicking on the* Next Item/Enter *button selects the option listed on the status line above the option buttons (*Perform Cal *in Figure 13 above). The option listed on the status line in any window is the option that was chosen the last time that menu was used.*

Clicking on any of the above choices opens a new window that allows you to perform that function. Proceed to the appropriate section for a detailed description of each option.

3.13.1 Perform Cal

Clicking on the *Perform Cal button* opens a window similar to Figure 14 below.

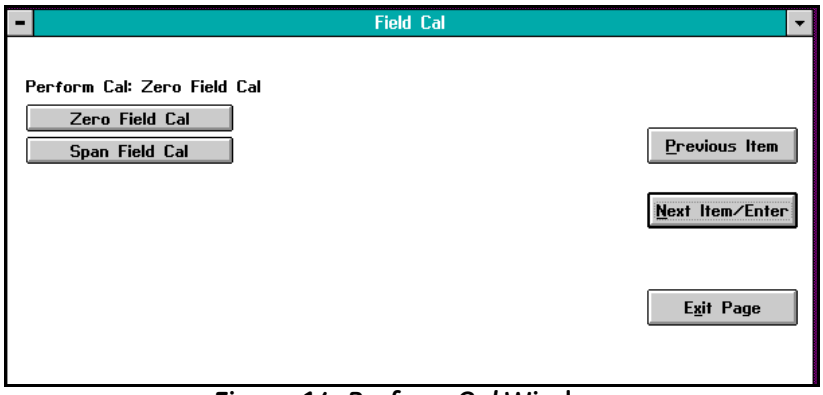


Figure 14: *Perform Cal* Window

Click on the *Zero Field Cal* button to calibrate the zero point or on the *Span Field Cal* button to calibrate the span point. In either case, a window similar to Figure 15 below opens.

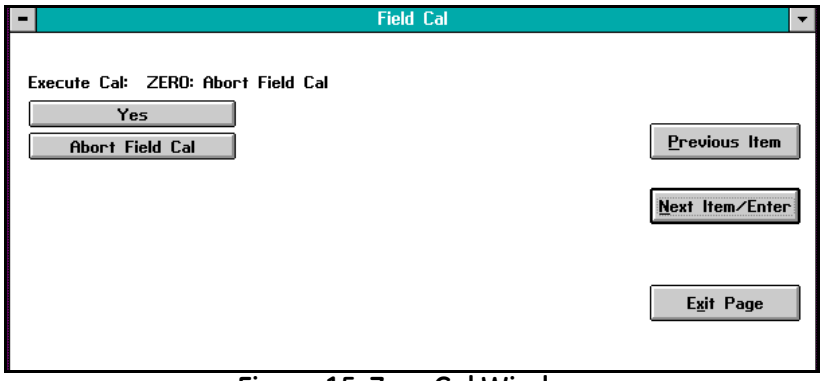


Figure 15: Zero Cal Window

Click *Yes* to perform the calibration, or *Abort Field Cal* to stop the calibration and return to the previous menu. The result of a completed calibration is shown in Figure 16 below.

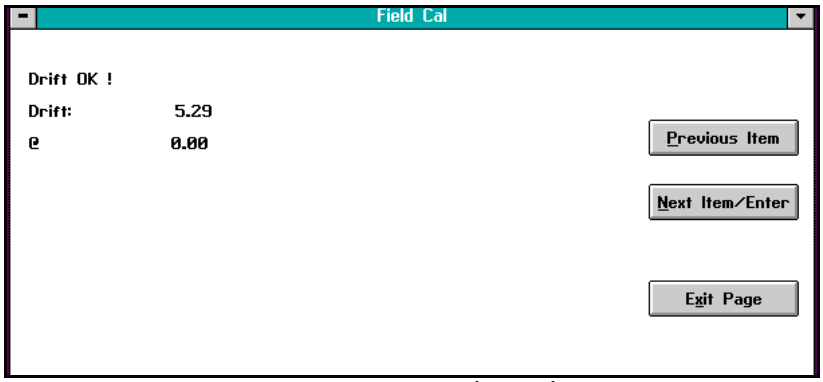


Figure 16: Zero Cal Results

Click on *Previous Item* or on *Next Item/Enter* to return to the previous window, or on *Exit Page* to return to the Instrument Menu.

3.13.2 Configure Cal

The *Configure Cal* option enables you to change the field calibration type and various calibration parameters. Clicking on the *Configure Cal* button opens a window like that shown in Figure 17 below.

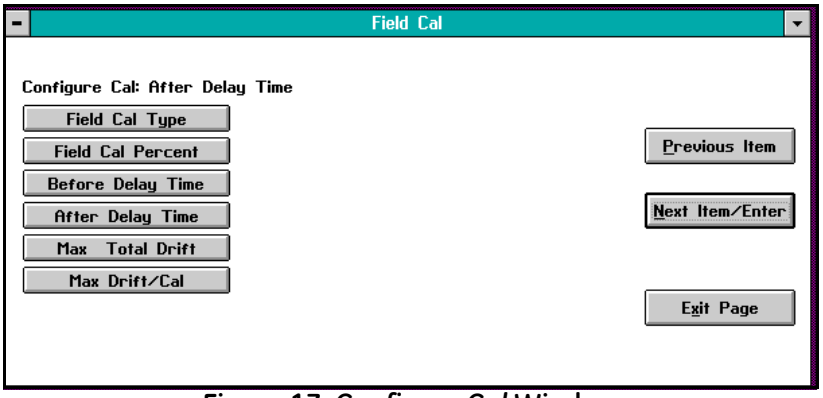


Figure 17: *Configure Cal* Window

Click on the desired option button and proceed to the appropriate section for a discussion of that option.

3.13.2a Field Cal Type

A typical *Field Cal Type* window is shown in Figure 18 below.

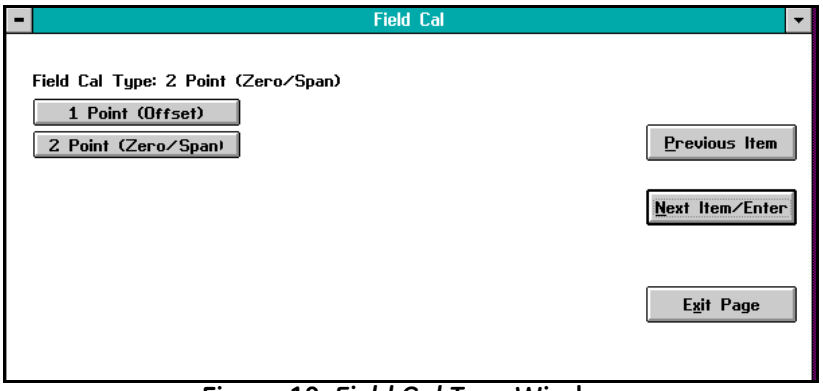


Figure 18: *Field Cal Type* Window

IMPORTANT: *The factory setting is the* 2 Point (Zero/Span) *calibration type.*

Click on the appropriate button to select the desired calibration type. Then, click on any button on the right to return to the *Configure Cal* window.

3.13.2b Field Cal Percent

A typical *Field Cal Percent* window is shown in Figure 19 below.

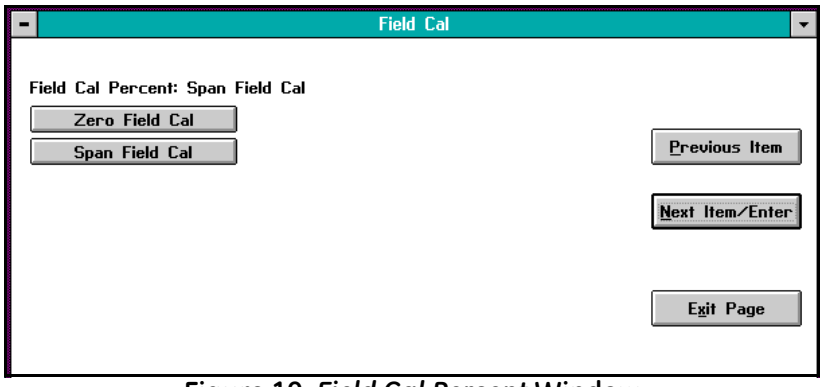


Figure 19: *Field Cal Percent* Window

The above menu is used to specify the oxygen percentages of the zero and span calibration gases that will be used. The recommended gases are listed on the XMO2 Calibration Data Sheet.

Click on the *Zero Field Cal* button to enter the percentage of oxygen in your zero gas. A window similar to Figure 20 below opens.

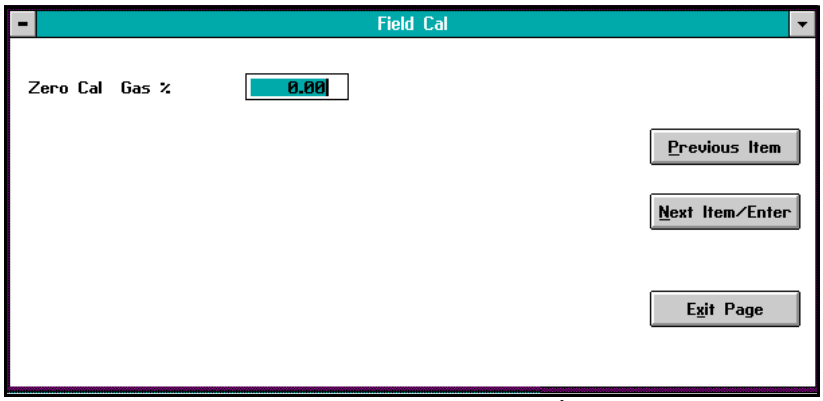


Figure 20: %O2 Entry Window

Type the zero gas oxygen percentage in the text box, and click the *Next Item/Enter* button to confirm the entry (click *Previous Item* or *Exit Page* button to leave the window without changing the existing percentage).

IMPORTANT: *The factory setting is for a 0.00% zero gas and a 20.93% span gas (air).*

Repeat the above procedure to enter your span calibration gas oxygen percentage. Then, click on any button on the right to return to the *Configure Cal* window.

3.13.2c Before Delay Time

Clicking on the *Before Delay Time* button opens a window similar to Figure 21 below.

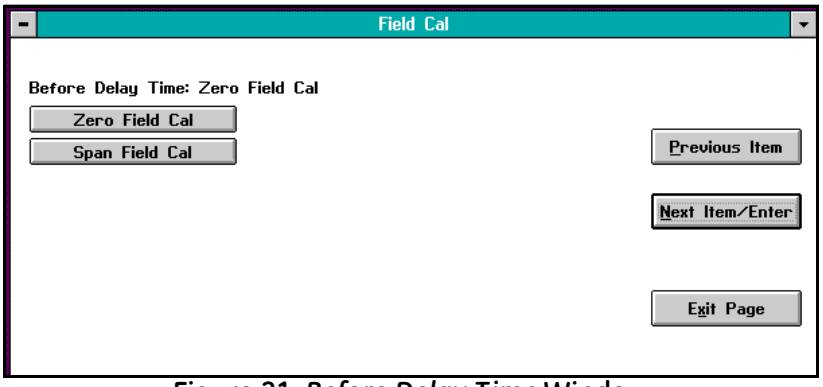


Figure 21: *Before Delay Time* Window

In the above window, click on the *Zero Field Cal* button to enter the before delay time for the zero calibration point. A window similar to Figure 22 below opens.

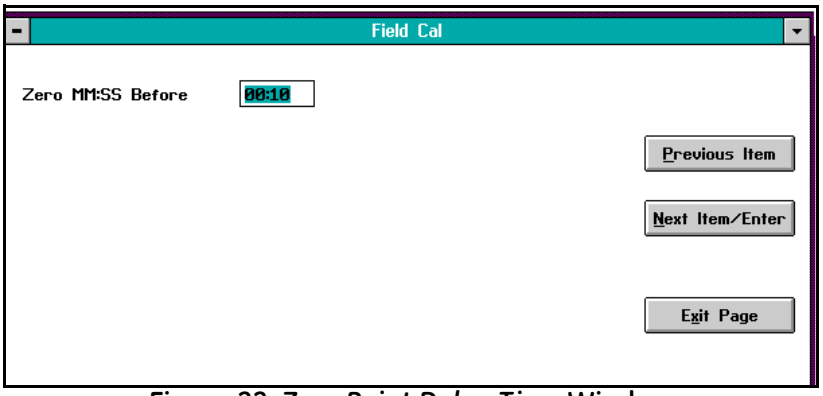


Figure 22: *Zero Point Delay Time* Window

Enter the desired zero point before delay time, in minutes and seconds, in the text box. Then, click on the *Next Item/Enter* button to confirm the entry (click the *Previous Item* or *Exit Page* button to exit the window without changing the existing value).

Repeat the above procedure to enter the before delay time for the span point.

3.13.2d After Delay Time

Repeat the procedure in the above section to set the *after delay time* for both the zero and span points.

3.13.2e Max Total Drift

Max Total Drift is the maximum total calibration drift allowable, expressed as a percentage of the full-scale reading. Selecting this option opens a window similar to Figure 23 below.

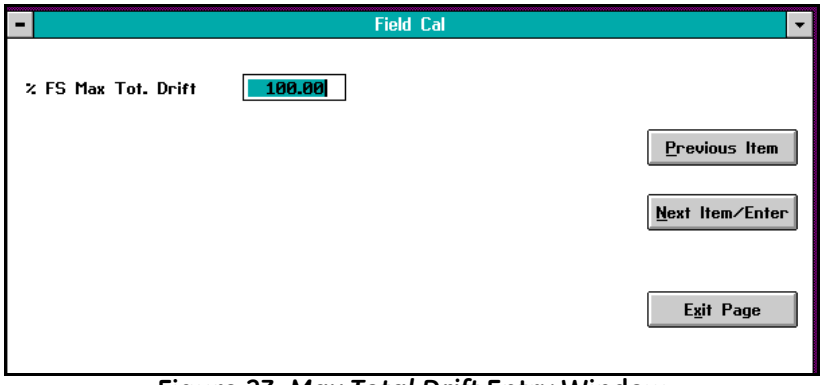


Figure 23: *Max Total Drift* Entry Window

Enter the desired percentage of the full-scale reading in the text box, and click the *Next Item/Enter* button to confirm the entry (click the *Previous Item* or *Exit Page* button to leave the window without changing the existing percentage).

3.13.2f Max Drift/Cal

Max Drift/Cal is the maximum calibration drift allowable per calibration, expressed as a percentage of the full-scale reading. To enter a value, repeat the procedures in the above section.

3.13.3 Calibration Drifts

The *Calibration Drifts* option enables you to view the current calibration drift at both the zero and span points since the last calibration was performed. Clicking on this button opens a window similar to Figure 24 below.

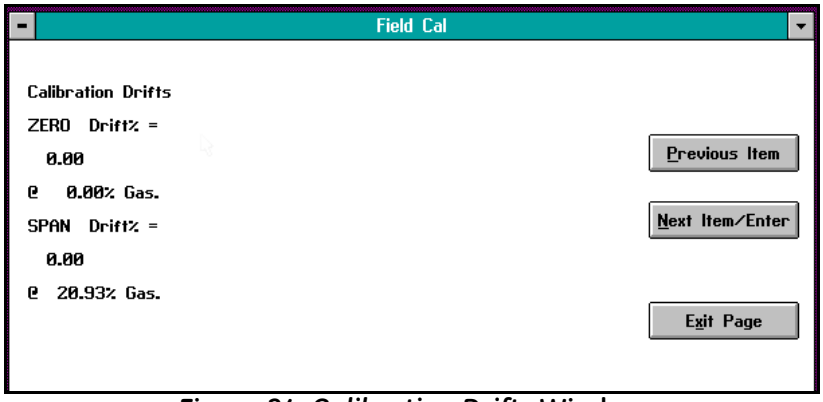


Figure 24: *Calibration Drifts* Window

Click on any button to return to the main *Field Cal* window.

3.13.4 Clear Calibration

The window for the *Clear Calibration* option is similar to Figure 25 below.

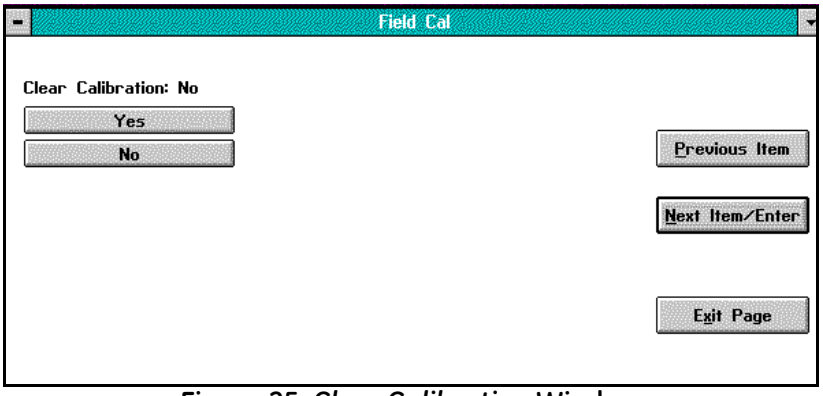


Figure 25: *Clear Calibration* Window

Click on the *Yes* button to clear the most recent calibration, or click on the *No, Previous Item* or *Exit Page* button to close the window without clearing the most recent calibration. If you click on the *Yes* button, a confirmation screen similar to Figure 26 below opens.

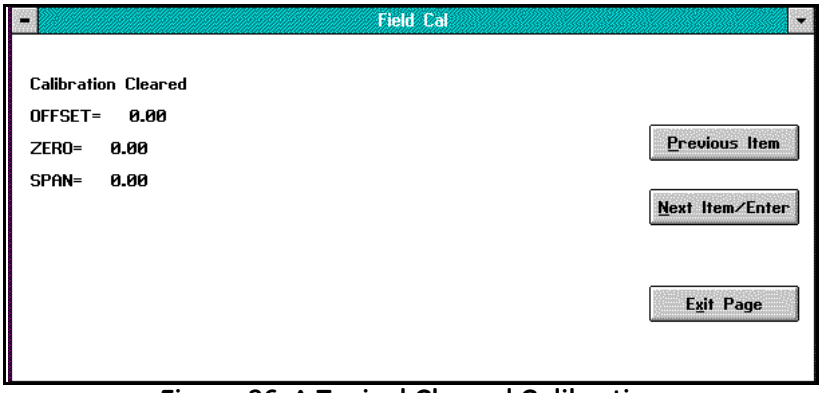


Figure 26: A Typical Cleared Calibration

Click on the *Previous Item* button to return to the *Clear Calibration* window, or click on the *Next Item/Enter* or *Exit Page* button to return to the main *Field Cal* window.

3.13.5 Hold Last Value

In addition to performing a field calibration or configuring the calibration parameters, you can program the XMO2 to hold the last calibrated value. To perform this task, click on the *Hold Last Value* button. You will notice that the text on the button now reads *Disable Hold Last.* To cancel the *Hold Last Value* programming, just click on this new button. You can toggle between the two states for this parameter by clicking on this button (remember that the current state is the one NOT written on the button).

3.14 Changing the 4-20 mA Analog Output Range

The XMO2 *Calibration Sheet* shipped with the unit lists the 4-20 mA analog output range that was set at the factory. IDM enables you to change this range via the *4-20mA Output* option. After you click on the *4-20mA Output* button from the *Edit Functions* menu (Figure 12 on page 30), a window similar to Figure 27 below opens. Clicking on any option opens the window for that option, while clicking on *Next Item/Enter* opens the menu listed on the status line above the options.

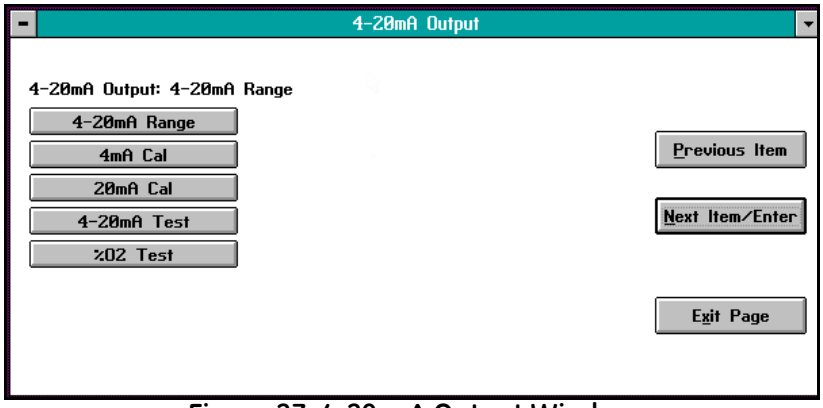


Figure 27: 4-20 mA Output Window

The *4-20mA Output* option offers the following five choices:

- *4-20mA Range* - specifies the oxygen percentage for both the 4 mA and 20 mA analog output points
- *4mA Cal* - calibrates the 4 mA point
- *20mA Cal* - calibrates the 20 mA point
- *4-20mA Test* - tests the analog output at various percent oxygen points
- *%O2 Test* - tests the analog output at various percent oxygen points

Note: *Clicking on the* Next Item/Enter *button selects the option listed on the status line above the option buttons (*4-20mA Range *in Figure 27 above). The option listed on the status line in any window is the option that was chosen the last time that menu was used.*

Clicking on any of the above choices opens a new window that allows you to perform that function. Proceed to the appropriate section for a detailed description of each option.

3.14.1 4-20mA Range

Selecting the *4-20mA Range* option opens a window similar to Figure 28 below.

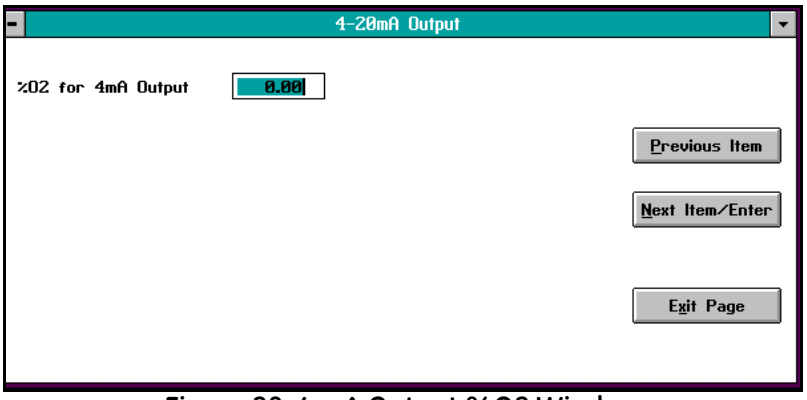


Figure 28: 4 mA Output %O2 Window

In the text box, enter the oxygen percentage in the sample gas that should generate an analog output of 4 mA. Then, click on the *Next Item/Enter* button to confirm the entry (click the *Previous Item* or *Exit Page* button to exit the window without changing the existing value) and open a window similar to Figure 29 below.

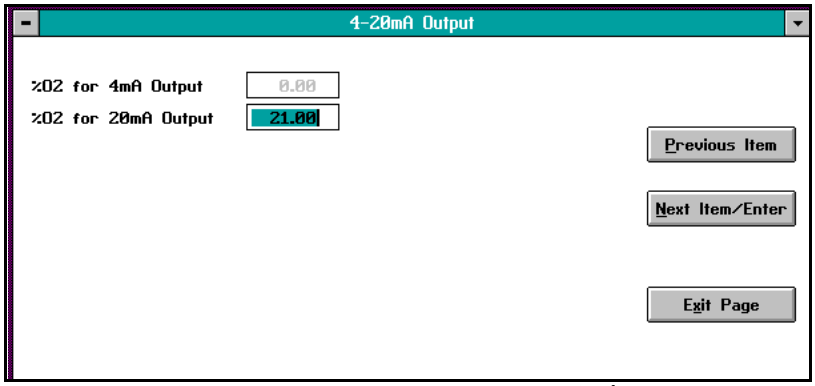


Figure 29: 20 mA Output %O2 Window

In the text box, enter the oxygen percentage in the sample gas that should generate an analog output of 20 mA. Then, click on the *Next Item/Enter* button to confirm the entry (click the *Previous Item* or *Exit Page* button to exit the window without changing the existing value).

The next window requires you to either *Clamp 4-20mA Output* or not. Select either *No* or *Yes* from the list box and click on the *Next Item/Enter* button to confirm the entry (click the *Previous Item* or *Exit Page* button to exit the window without changing the existing value).

Note: *A clamped output cannot display measurements outside the programmed 4-20 mA analog output range, while a reading that is not clamped can display measurements outside the programmed range.*

3.14.2 4mA Cal

Click on the *4mA Cal* button to open a window similar to Figure 30 below and force the analog output to exactly 4.00 mA. This allows you to calibrate the 4 mA point of the analog output signal.

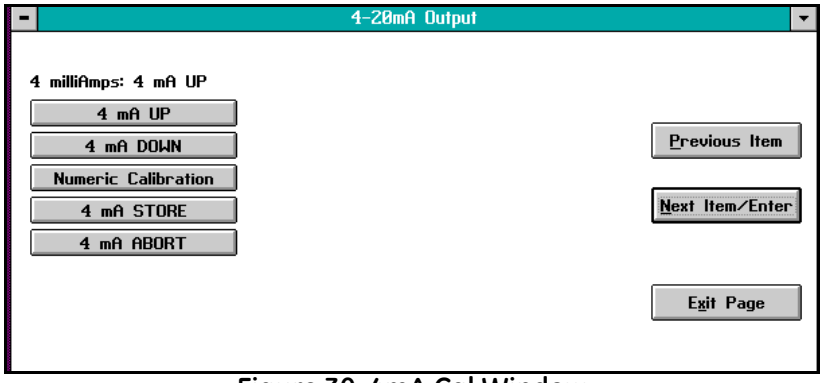


Figure 30: 4mA Cal Window

Use an ammeter connected to the analog output terminals on the rear panel to monitor the 4-20 mA output signal. Calibrate the 4 mA point by clicking on the *UP* and/or *DOWN* buttons until the ammeter reads exactly 4.00 mA. Alternatively, you can click on the *Numeric Calibration* button to open a window like Figure 31 below.

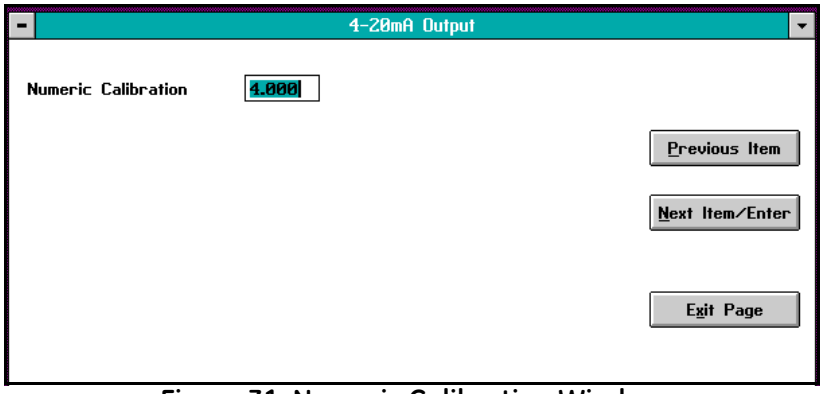


Figure 31: Numeric Calibration Window

Enter the desired current reading (4.00) in the text box and click on the *Next Item/Enter* button (click on the *Previous Item* or *Exit Page* button to close the window without changing the value).

After you have calibrated the 4 mA signal, click on the 4mA *STORE* button to save the calibration. However, if the calibration is not satisfactory, click on the *4mA ABORT* button to cancel the calibration.

3.14.3 20 mA Cal

Repeat the instructions in the section above to calibrate the 20 mA point of the analog output signal.

3.14.4 4-20mA Test

Selecting the *4-20mA Test* option opens a window similar to Figure 32 below.

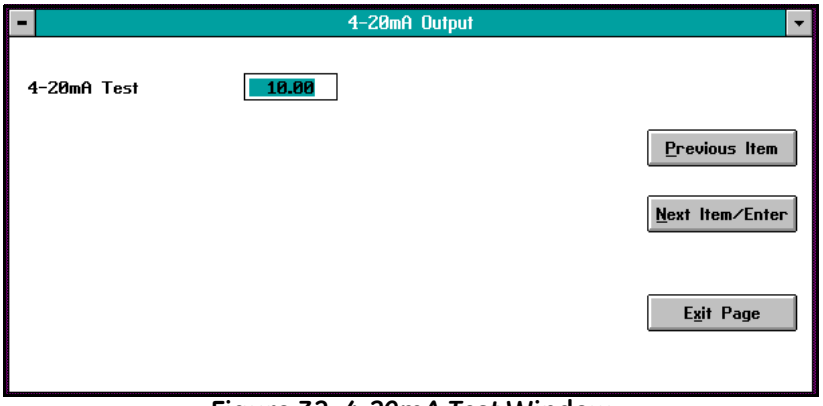


Figure 32: *4-20mA Test* Window

Enter a current value in the 4-20 mA range to force the analog output signal to that value. Click on the *Next Item/Enter* button and verify that the ammeter connected to the output terminals on the rear panel reads the correct value. You may repeat this procedure as many times as desired to test the output at various points in the 4-20 mA range. When you have finished, click the *Exit Page* button to close the window.

3.14.5 %O2 Test

Selecting the *%O2 Test* option opens a window similar to Figure 33 below.

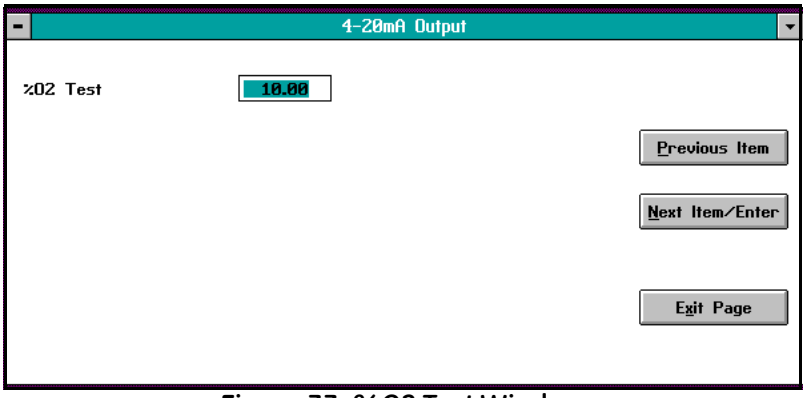


Figure 33: *%O2 Test* Window

Enter an oxygen percentage in the text box. Click on the *Next Item/Enter* button and verify that the digital display on the front panel reads the correct value. You may repeat this procedure as many times as desired to test the display reading at various oxygen percentages. When you have finished, click the *Exit Page* button to close the window.

[no content intended for this page - proceed to next page]

Chapter 4. Programming with Instrument Data Manager

4.1 Introduction

The XMO2 is factory-programmed and ready for immediate use. However, you can access its programming with your PC, using the GE Sensing *Instrument Data Manager* (IDM) software. IDM also allows you to upload or download site files, display data, and log and view real-time data and diagnostic data in numeric, bar chart or line chart formats. For further information on the display and logging functions, refer to the *Instrument Data Manager User's Manual (910-185).* Since Chapter 3, *Startup & Operation*, describes the *Field Cal* and *4-20 mA Output* options, this chapter covers the *Error Handler, Factory Cal* and *Advanced* options in the *Edit Functions* menu.

Note: *Be sure you have properly installed Instrument Data Manager on your PC before attempting to program the XMO2.*

4.2 The *Edit Functions* Menu

To access the XMO2 calibration, you must pull down the *Edit Functions* menu from the Instrument window.The menu consists of the five commands displayed in Figure 34 below. To access any of the commands, simply select it from the menu.

Note: *As a programming aid, the relevant portions of the* Edit Functions *menu have been mapped in Appendix C.*

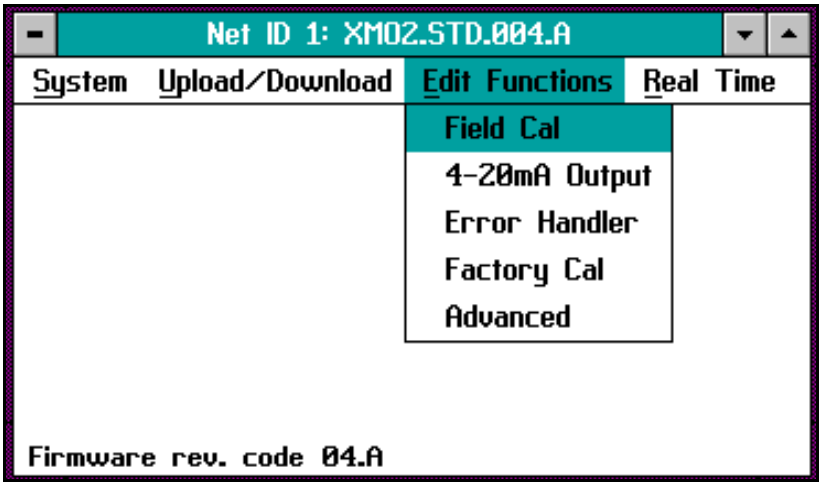


Figure 34: *Edit Functions* Menu

The following three buttons appear at the right of all menu windows (see Figure 35 on page 44):

- *Previous Item* - returns you to the previous window (either the command menu or the previous parameter entered).
- *Next Item/Enter* - confirms the selection or data entered, and either opens the next window or returns you to the command menu (depending on your position in the program).
- *Exit Page* - returns you to the command menu.

4.2.1 The *Error Handler* Menu

Note: *For information on the* Field Cal *and* 4-20 mA Output *options, refer to Chapter 3.*

The *Error Handler* menu allows you to configure the manner in which the XMO2 responds to various error conditions. When you click on the *Error Handler* button in the *Edit Functions* menu (Figure 34 on page 43), a window similar to Figure 35 below opens.

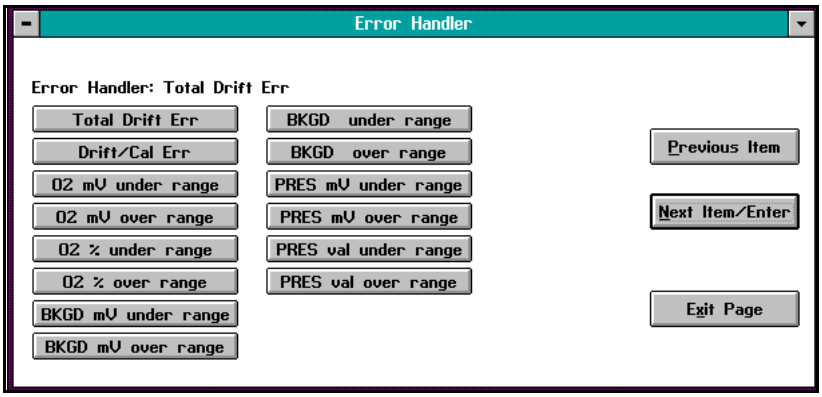


Figure 35: *Error Handler* Window

There is a button in the above window for each of the following error conditions:

- Total Drift Err
- Drift/Cal Err
- O2 mV under range
- O2 mV over range
- O2 % under range
- O2 % over range
- BKGD mV under range
- BKGD mV over range
- BKGD under range
- BKGD over range
- PRES mV under range
- PRES mV over range
- PRES val under range
- PRES val over range

To configure the XMO2's response to any of the above error conditions, click on the corresponding button in the window above and proceed to the appropriate section for instructions.

4.2.2 Total Drift Error

The *Total Drift Error* option lets you enable or disable error handling for a total calibration drift error and to specify the mA output that will be generated during an error condition (typically 23 mA). Clicking on this button opens a window similar to Figure 36 below.

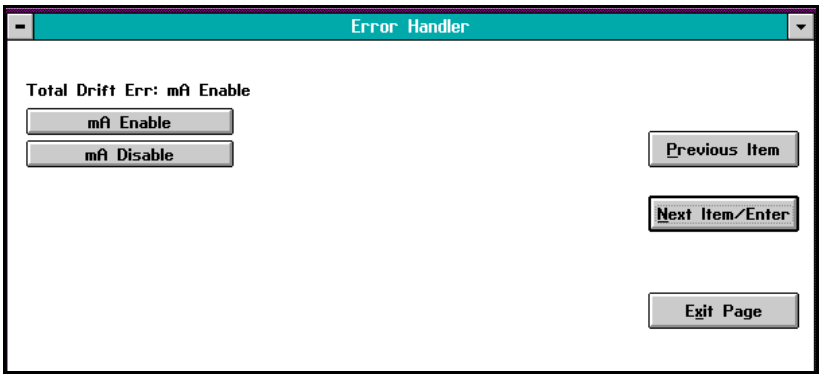


Figure 36: Total Drift Error mA Window

Click on the appropriate button to either *enable* or *disable* error handling for this condition at the XMO2's analog output. If you clicked on the *mA Disable* button, skip the next screen. If you clicked on *mA Enable*, a window similar to Figure 37 below opens.

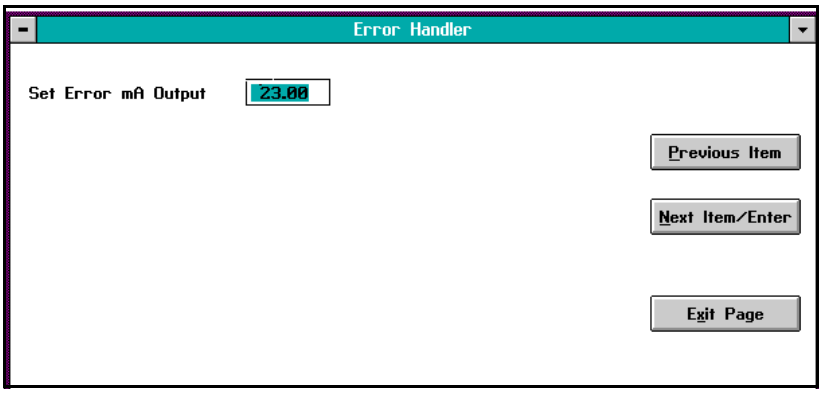


Figure 37: Error mA Output Entry Window

In the text box at the above screen, enter the mA output that you wish to have generated in the event of a total calibration drift error. Click on the *Next Item/Enter* button to confirm the entry.

4.2.2 Total Drift Error (cont.)

After specifying the analog output response to this error condition, a window similar to Figure 38 below opens.

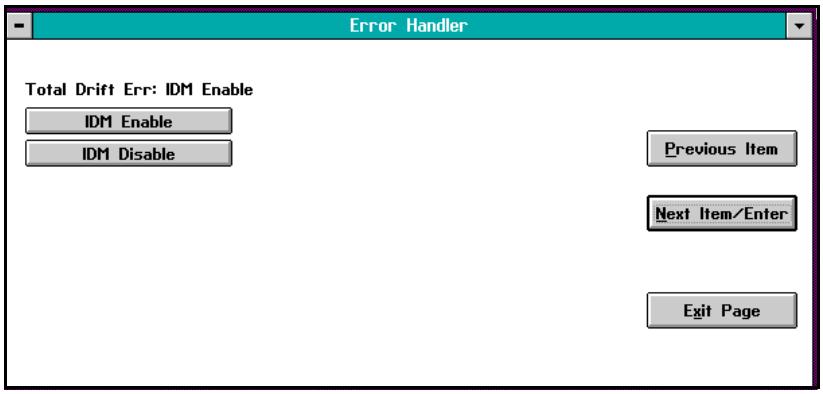


Figure 38: Total Drift Error IDM Window

Click on the appropriate button to either *enable* or *disable* the generation of an error signal for this condition via the XMO2's IDM link. In either case, you will be returned immediately to the main *Error Handler* menu.

4.2.3 All Other Error Conditions

The programming for all of the other XMO2 error conditions listed on page 44 is identical to that described in the previous section for the *Total Drift Err* condition. Therefore, simply refer to the instructions in the previous section to configure the error handling for any of these other conditions. All three windows will be identical to those shown in the previous section, except that the error listed above the *Enable/Disable* buttons will reflect the specific error currently being programmed.

4.3 The *Factory Cal* Menu

The XMO2 comes from the factory completely programmed for your particular application. Should it become necessary to restore the factory setup, you can use the *Factory Cal* menu and your *Calibration Data Sheet* to reenter the factory data.

CAUTION! Always refer to your Calibration Data Sheet for the data to enter in the *Factory Cal* menu. Entering incorrect data will result in inaccurate operation of the XMO2.

4.3.1 Background Gas Labels

From the *Edit Functions* menu (shown in Figure 34 on page 43), click on the *Factory Cal* button. A screen similar to Figure 39 below opens.

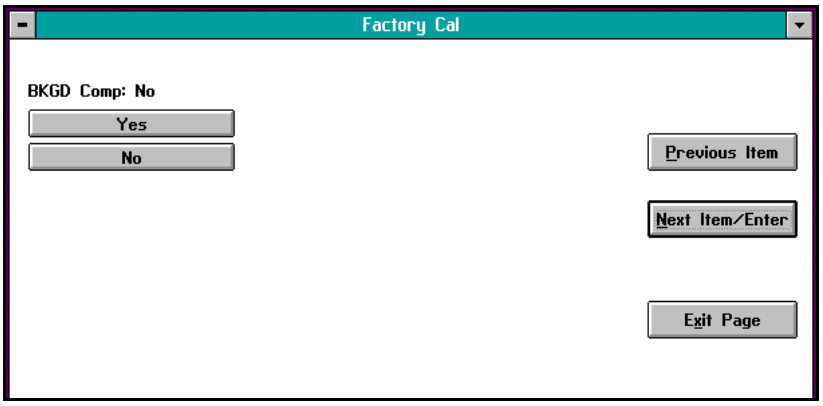


Figure 39: *BKGD Comp* Window

Note: *If background gas compensation is not required for your XMO2, click on the* No *button in the above window and proceed directly to the* Pressure Compensation *section on the next page.*

To enter your background gas labels click on the *Yes* button above. A window similar to Figure 40 below opens.

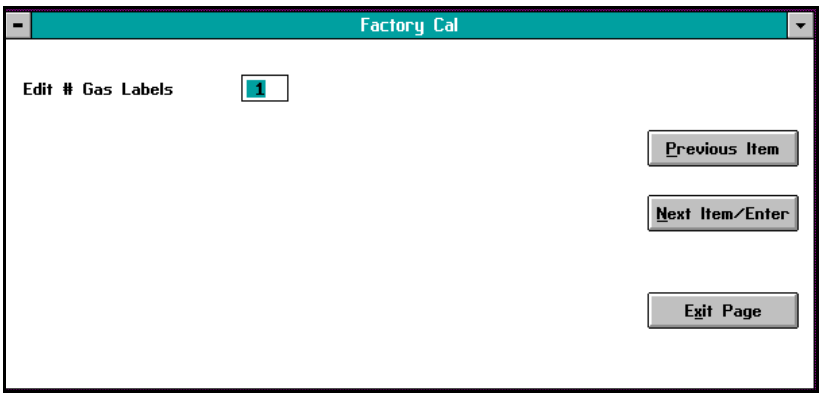


Figure 40: *Edit # Gases* Window

4.3.1 Background Gas Labels (cont.)

In Figure 40 on page 47, enter the number of background gases for which you have compensation data. Then, press the *Next Item/Enter* button to open a window similar to Figure 41 below.

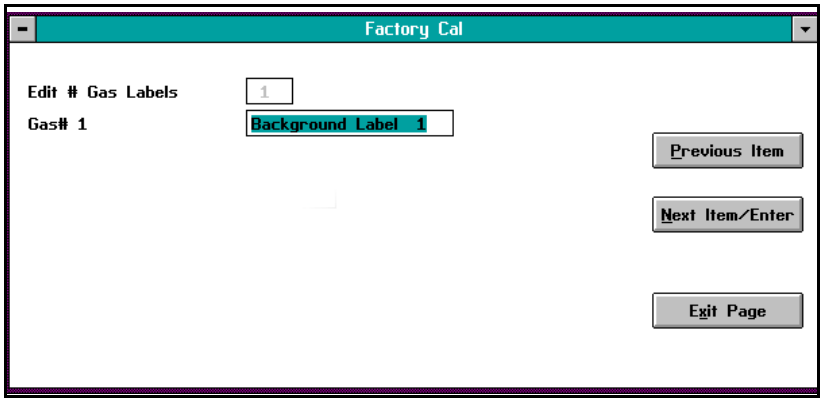


Figure 41: Point Editing Window

In the above window, enter an identifying label for background gas #1, and click on the *Next Item/Enter* button. The above sequence will repeat until you have entered identifying labels for each of your background gases.

4.3.2 Pressure Compensation

If you did not enter any background gas labels or upon entering your final background gas label, a window similar to Figure 42 below opens.

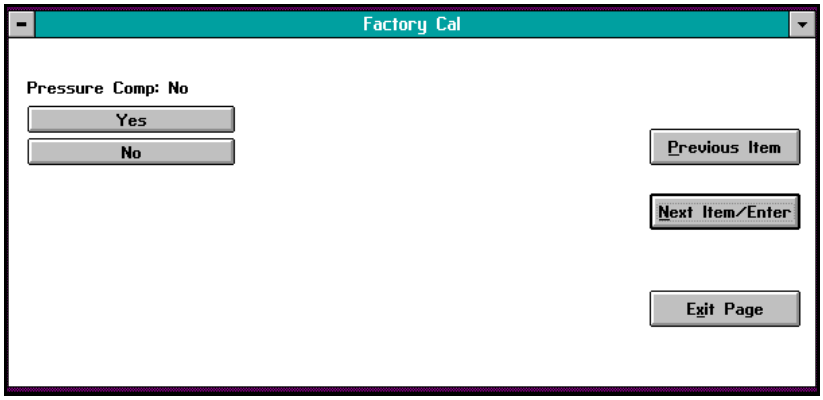


Figure 42: *Pressure Comp* Window

Note: *If pressure compensation is not required for your XMO2, click on the* No *button in the above window and proceed directly to the* Entering Data Points *section on page 51.*

4.3.2a Number of Pressures

When you click on the *Yes* button in Figure 42 on page 48, a window similar to Figure 43 below opens.

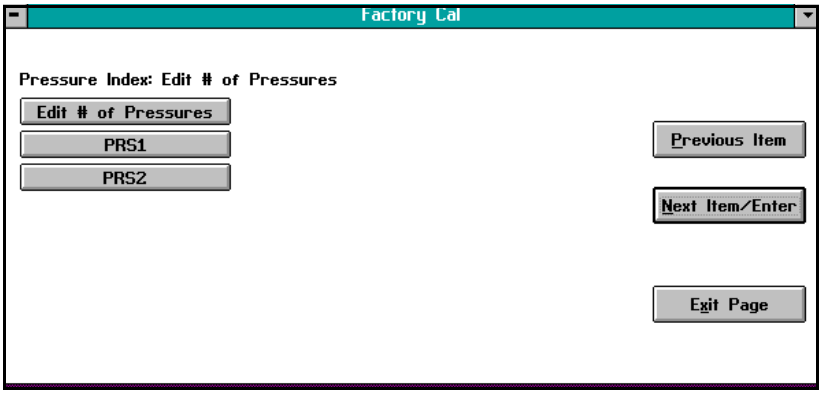


Figure 43: *Edit # Pressures* Window

To enter your pressure compensation data (be sure to reference your *Calibration Data Sheet*) click on the *Edit # of Pressures* button above to open a window similar to Figure 44 below.

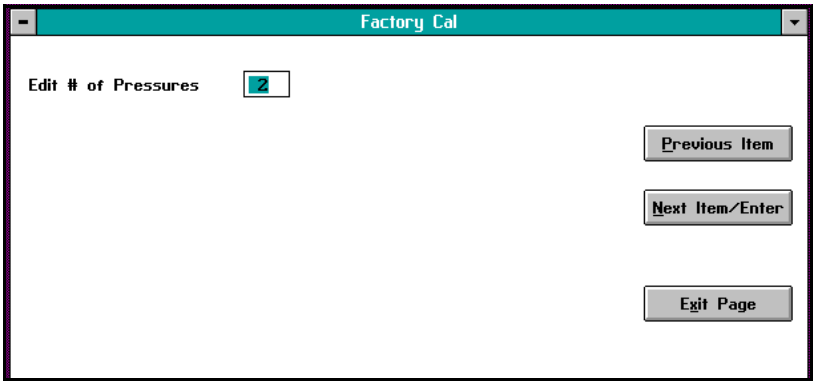


Figure 44: *Edit # Pressures* Window

In Figure 44 above, enter the number of pressures for which you have compensation data. Then, press the *Next Item/Enter* button to return to the window in Figure 43 above.

4.3.2b Pressure #1 Background Gases

Note: *If you are not using background gas compensation, this menu does not appear. Proceed directly to the next section.*

To begin entering your data points for each of the pressure compensation curves, click on the *PRS1* button in Figure 43 on page 49 to open a window similar to Figure 45 below.

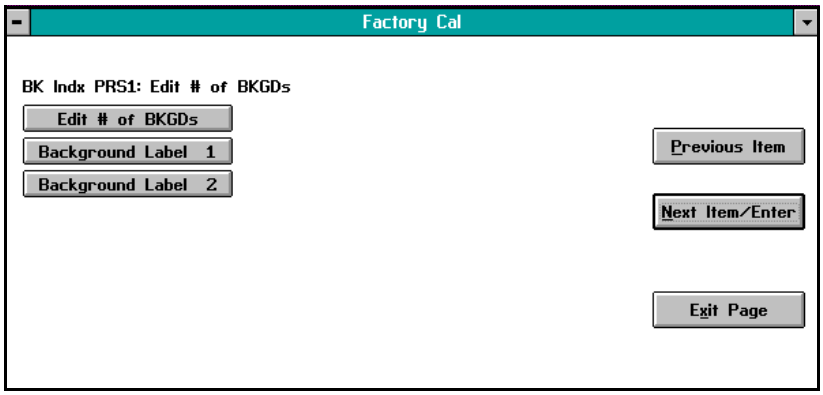


Figure 45: *Background Gas* Window

In the above window, click on the *Edit # of BKGDs* button to open a window similar to Figure 46 below.

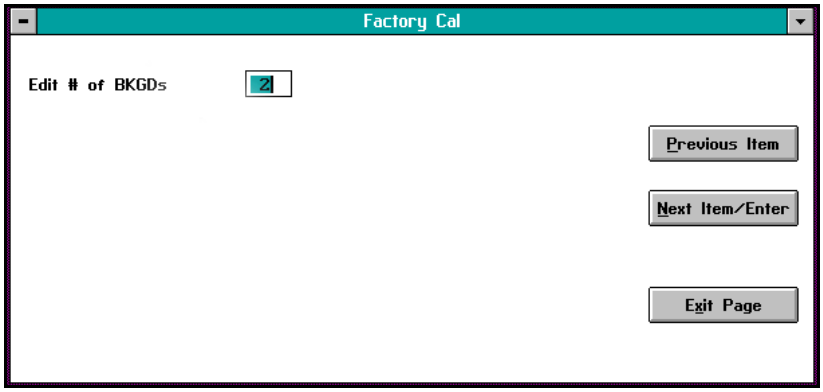


Figure 46: *Edit # of BKGDs* Window

In the above window, enter the number of background gases for which you have compensation data at the first compensated pressure. Then, click on the *Next Item/Enter* button to confirm your entry and return to the window in Figure 45 above.

Entering Data Points

In the window shown in Figure 45 on page 50, click on the *Background Label 1* button (the actual text on this button will correspond to the label you entered in the previous section) to open a window similar to Figure 47 below.

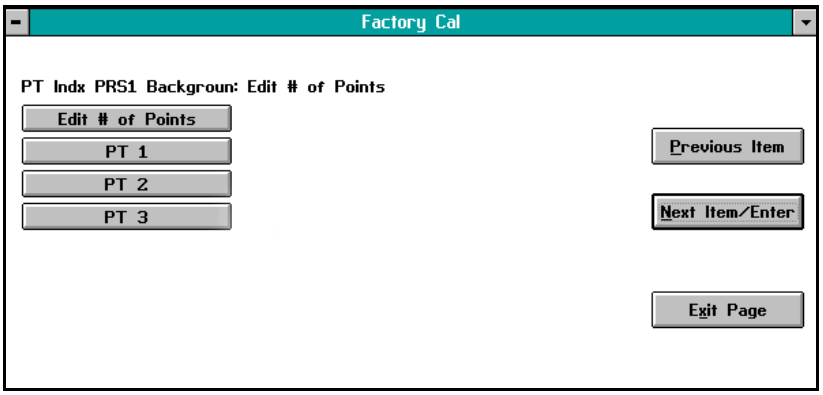


Figure 47: *PRS1 BKGD Points* Window

In the above window, click on the *Edit # of Points* button to open a window similar to Figure 48 below.

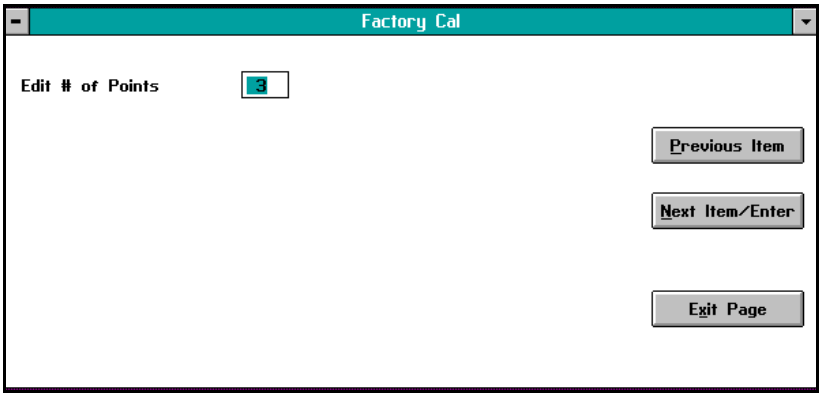


Figure 48: *PRS1 BKGD Points* Window

To begin entering your data, click on the *PT 1* button in Figure 47 above to open a window similar to Figure 49 below.

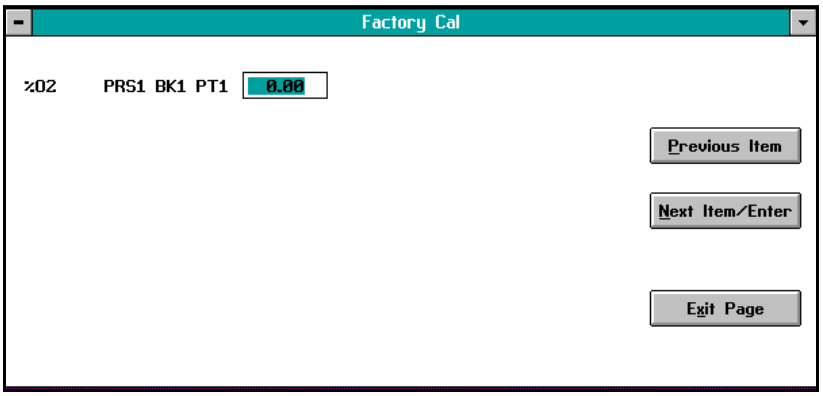


Figure 49: *%O2 Data* Window

4.3.2c Completing the Process

By using the window in Figure 49 on page 51 and clicking on the Next Item/Enter button after each entry, you will be able to enter a value for each of the following parameters:

Note: *The following list assumes that you are using both pressure and background gas compensation. If you are not using pressure compensation, the* Prssure *and* Prs mV *parameters do not appear; if you are not using background gas compensation, the* BK mV *parameter does not appear.*

- %O2
- Prssure
- O2 mV
- BK mV
- Prs mV

After entering the last parameter, you will be returned to the screen shown in Figure 49 on page 51. Finish the programming of this section by completing the following steps:

1. Repeat the procedure beginning at Figure 47 on page 51 until you have entered data for each parameter at all of the points listed.
2. Click on the Exit Page button to return to Figure 45 on page 50.
3. Repeat the procedure beginning at Figure 45 on page 50 until you have entered data for each of the labeled background gases.
4. Click on the Exit Page button to return to Figure 43 on page 49.
5. Repeat the procedure beginning at Figure 43 on page 49 until you have entered data for each of the listed pressures.
6. Click on the Exit Page button in Figure 43 on page 49.

You have now completed the programming of the *Factory Cal* menu and you should be back at the main meter window.

4.4 The *Advanced* Menu

The final option in the *Edit Functions* menu (refer to Figure 34 on page 43) is *Advanced*. To select this option, click on the *Advanced* button, and a window similar to Figure 50 below opens.

IMPORTANT: *You cannot enter this menu unless you have a valid password. Your assigned password is listed on the page at the end of this chapter.*

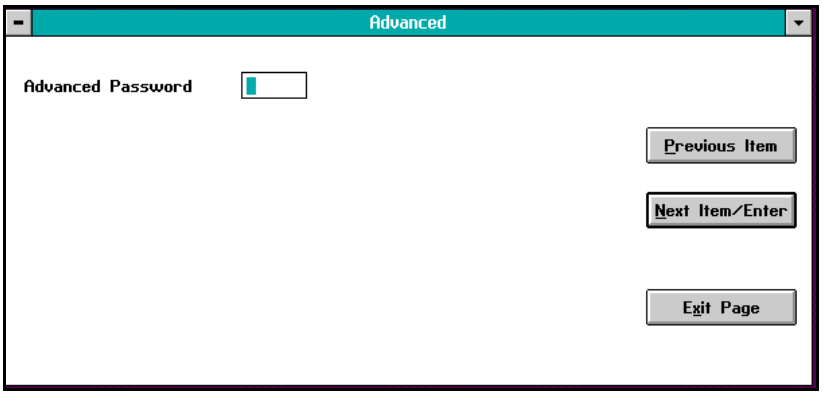


Figure 50: Password Window

Enter your password in the text box above and click on the *Next Item/Enter* button. Then, a window similar to Figure 51 below opens.

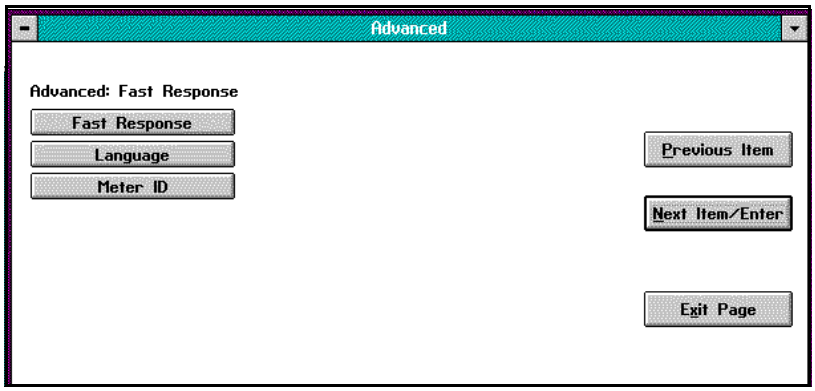


Figure 51: *Advanced* Main Menu

The following options are available in this menu:

- *Fast Response* - a software enhancement resulting in faster performance under certain conditions
- *Language* - change the language used for the XMO2 menus
- *Meter ID* - change the meter identification number

To select one of the above options, click on the corresponding button in the window above and proceed to the appropriate section for instructions.

4.4.1 Fast Response

IMPORTANT: *ATEX compliance with EN 50104 requires both:*

- *Fast Response* calibration of the XMO2 transmitter
- *Pressure Compensation* of the XMO2 or constant control of the sample system pressure.

IMPORTANT: *The response type has been factory preset for your application requirements. If considering a response-type change, always consult the factory first.*

When you select the *Fast Response* option, a window similar to Figure 52 below opens.

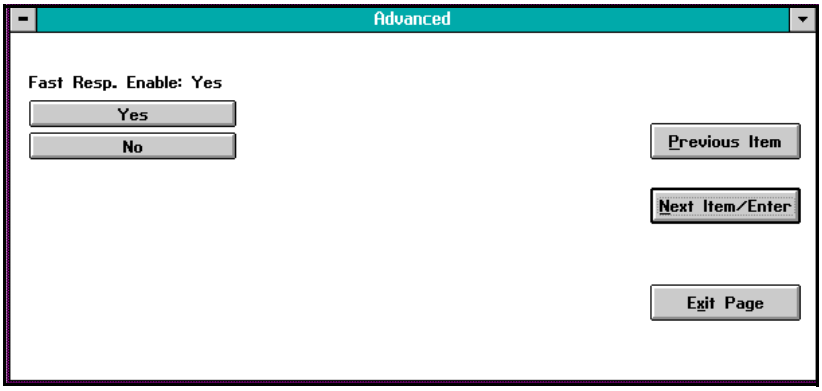


Figure 52: *Fast Response* Window

Click on the appropriate button to either *enable* or *disable* the Fast Response software. If you clicked on the *No* button to disable Fast Response, you are immediately returned to the *Advanced* main menu. However, if you clicked on the *Yes* button to enable *Fast Response*, you are prompted to enter values for the following three parameters:

CAUTION! Do not change the factory default values for any of these parameters without first consulting the factory.

- Fast Tau up
- Fast Tau down
- Fast Threshold %FS

Enter a value for the first parameter, and click on the *Next Item/Enter* button to confirm the entry and move to the next parameter. After confirming the final parameter, you are returned to the *Advanced* main menu.

4.4.2 Language

When you click on the *Language* button, a window similar to Figure 53 below opens.

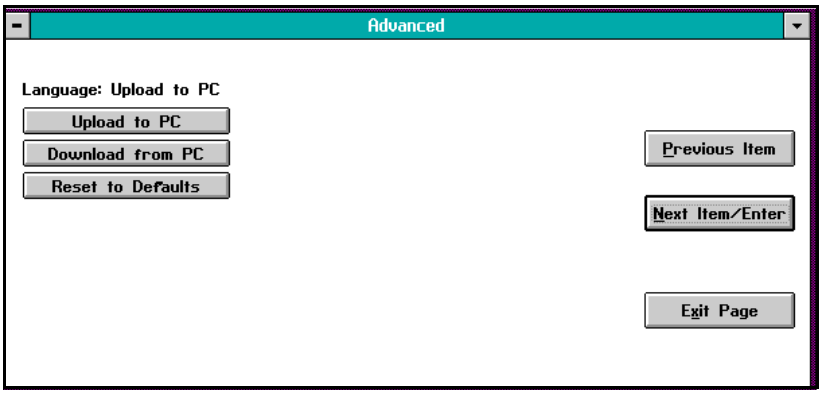


Figure 53: *Language* Window

The standard language used for the XMO2 menus is *English*, and these strings are stored in a meter file called *default.txt*. If you wish to translate this file into another language, click on the *Upload to PC* button, and a window similar to Figure 54 below opens.

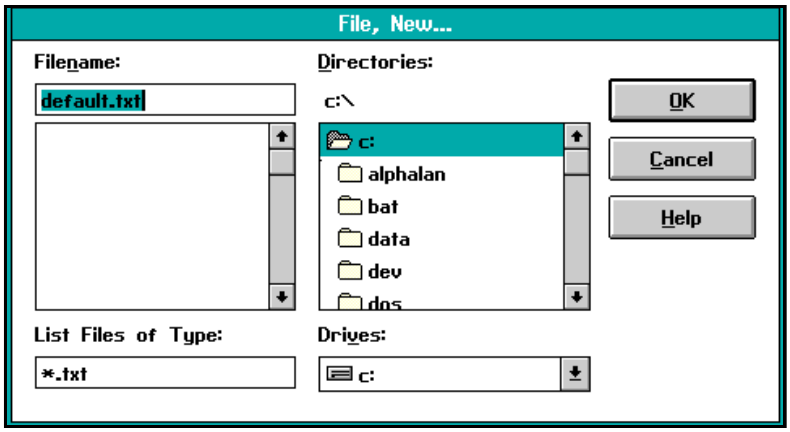


Figure 54: Creating a Data File

In the above window, specify the directory on your PC where you want to copy the default.txt file and click on the *OK* button. The file will be saved to your PC and you will be returned to the *Language* main menu.

Next, open the PC file in any word processor and translate the menu strings into the desired language. Be very careful not to change any of the formatting or punctuation in the file. Finally, save the file with a new name (*.txt).

4.4.2 Language (cont.)

To load your translated menu string file into the XMO2, click on the *Download from PC* button to open a window similar to Figure 55 below.

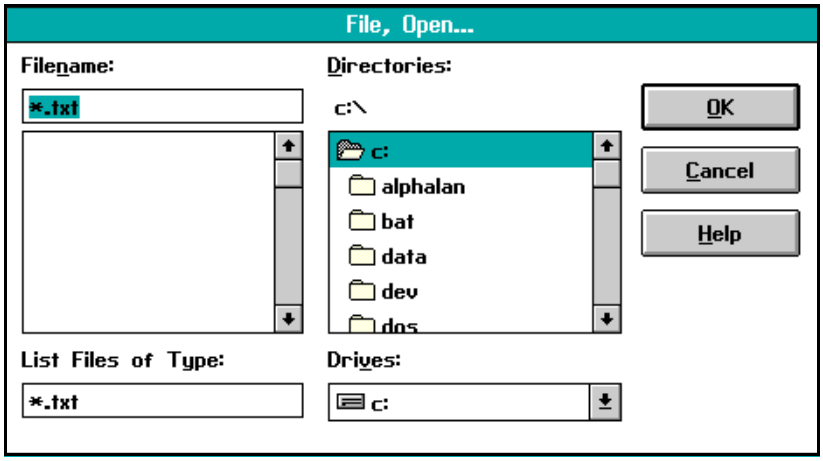


Figure 55: Downloading a Data File

In the above window, navigate to the location and name of your translated menu string file on the PC and click on the OK button. The new file will be loaded into the XMO2. After you power down the meter and restart it, all of the menus will be displayed in the new language.

If after loading a new text file in a different language, you wish to return to the original English menus, simply click on the *Restore to Defaults* button. The XMO2 will reload a copy of the factory default.txt file from its memory and the menus will once again appear in English.

4.4.3 Meter ID

When you click on the *Meter ID* button, a window similar to Figure 56 below opens.

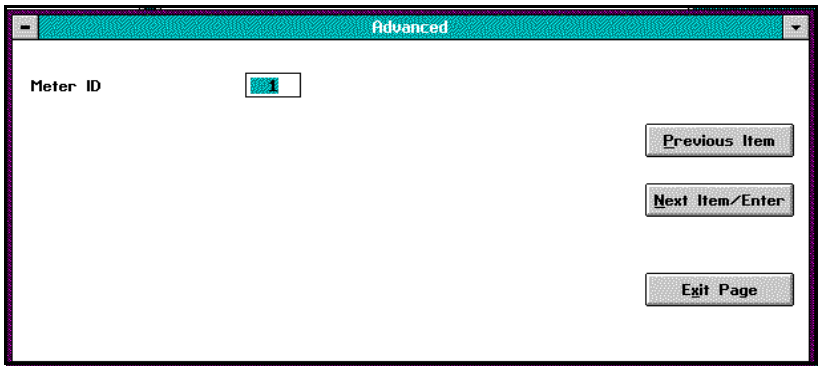


Figure 56: *Meter ID* Window

At the above window, you may either leave the existing meter ID number without change, or enter a new meter ID number. In either case, click the *Next Item/Enter* button to confirm the entry (or click the *Previous Item* or *Exit Page* button to leave the window without changing the meter ID number).

If you changed the existing meter ID number, a window similar to Figure 57 below opens.

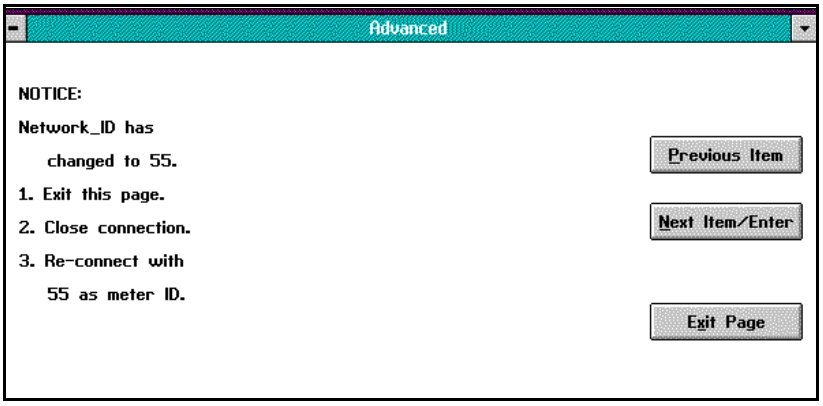


Figure 57: Instructions for New Meter ID Number

Note the instructions above for reconnecting your XMO2 to the PC using the new meter ID number. Then, click on the *Next Item/Enter* or *Exit Page* button to return to the *Advanced* main menu.

IMPORTANT: *Once you have entered a new meter ID number, you cannot immediately change the number again. You* must *exit the page, close the connection, and reconnect the meter using the new meter ID number. If you wish, you may then repeat the process to enter another meter ID number.*

Your assigned password is: 2719.

Please remove this page and keep it in a safe place for future reference.

Chapter 5. Specifications

5.1 Performance

Accuracy	*0-1% O_2 range:* ±2% of span *80-100% and 90-100% O_2 ranges:* ±0.2% O_2 *All other ranges:* ±1% of spam
Linearity	±0.5% of span
Repeatability	±0.2% of span
Measurement Resolution	0.01 mA
Stability	*Zero:* ±1.0% of span per month (±2% of 0-1% O_2 range) *Span*: ±0.4% of span per month (±-/9% for 0-1% O_2 range
Response Time	Fast Response enabled: <5 seconds for 63% of step change Damped Response enabled: 40 seconds for 63% of step change
Measurement Ranges (typical)	0-1% 0-2% 0-5% 0-10% 0-21% 0-25% 0-50%* 0-100%* 80-100%* 90-100%* *Pressure compensation required
Controlled Sensor Temperatures	Standard: 45° (113°F) Optional: 60°C or 70°C (140°F or 158°F)
Atmospheric Pressure Effect	*Standard:* ±0.2% of span per mm of Hg *Optional:* Pressure compensation
Required Sample Gas Flow Rate	*Range:* 0.1 to 2.0 SCFH (50 to 1,000 cc/min) *Nominal:* 1.0 SCFH (500 cc/min) nominal
Sample Gas Flow Rate Effect:	<1% of span, with weatherproof enclosure, background gas compensation, and 0.1-2.0 SCFH (50-1,000 cc/Min) flow rate
Warmup Time:	30 minutes

5.2 Functional Specifications

Analog Output	4-20 mA isolated, 800 Ω max, load, isolated, field-programmable
Digital Output	RS232, 3-conductor
Power Input	24.0 VDC ±4 VDC @ 1.2 A maximum
Cable (Power Input and Analog Output)	*Standard:* 10 ft (3 m), 4-conductor, shielded, P/N X4(10); lengths up to 4000 ft. *Optional:* lengths to 450 ft. (137 m) available
Cable (Digital Output)	6 ft (2 m), 3-conductor, shielded, P/N 704-667, 668, 669, or 670 *Connector:* DB9 male, DB9 female, DB25 male, or DB25 female *Lengths:* up to 4,000 ft (1,200 m)
Operating Temperature	*Standard:* +45°C (+113°F) *Optional:* +60° or +70°C (+140°F or +158°F)
Ambient Temperature Range	*Standard 45°C unit:* -20° to +40°C (-4° to +104°F) *Optional 60°C unit:* -5 to 55°C (23 to 131°F) *Optional 70°C unit:* 5 to 65°C (41 to 149°F)
Sample Gas Pressure Range:	20 psig maximum

5.3 Physical Specifications

Sensor Wetted Materials	*Standard:* 316 SS, glass, and Viton™ o-rings *Optional:* Hastelloy, Monel, or Titanium with Chemraz™ o-rings
Dimensions	*Weatherproof unit:* 9.53” (H) x 5.71” (D) (242 x 145 mm) *Explosion-proof unit:* 10.47” (H) x 5.71” (D) (266 x 145 mm)
Weight	9.5 lb (4.3 kg)
Connections	*Electrical:* 3/4 in. NPTF conduit and 6-terminal, removable connector *Process:* 1/4 in. NPTF inlet and outlet
Environmental	*Weatherproof:* TYPE 4X; IP66 *Explosion-proof: FM/CSA:* Class I, Div. 1, Groups A, B, C, D *Flameproof*: II 2 GD EEx d IIC T6 or T5 ISSeP02ATEX022 Ex d II C T6 IP66 Cl. I, Zone 1 *CE:* EMC2004/108/EC PED 97/23/EC Lloyd’s Registry approval

Note: *For CE compliance, the power and I/O cables must be shielded. All cables must be terminated within the cable gland at the XMO2.*

5.4 Optional Accessories

GE Sensing offers a complete line of optional accessories for use with the XMO2 transmitter. These include:

- **PS5R-C24:** 24 VDC power supply
- **X4(*):** 4-conductor cable for power input and analog output connections (* specifies length in feet) lengths up to 450 ft (137 m) are available
- **704-(667, 668, 669, or 670)-*:** 3-conductor cable for digital output connections (* specifies length in feet) DB9 male, DB9 female, DB25 male, and DB25 female connectors are available

The XMO2 can also be interfaced with other GE Sensing displays and analyzers, such as:

- **TMO2D**, **LDP**, and **XDP** display/control modules
- **Moisture Image Series 1** and **Moisture Monitor Series 3** Analyzers
- **System 1** Analyzer

5.5 Ordering Information

A	B	C	D	E
XMO2 -				

A: *Transmitter Model*

XMO2 -

B: *Measuring Cell Package (requires 24 VDC, 1.2 A power supply)*

- **1 -** Weatherproof Enclosure
- **2 -** Explosion-Proof/Weatherproof Enclosure
- **X -** Without Enclosure (Spare Cell)

C: *CE Compliance*

- **H -** Standard
- **C -** Compliant

D: *Pressure Compensation*

- **1 -** Background gas compensation only (standard)
- **2 -** Atmospheric pressure and background gas compensation (optional)
- **3 -** background gas compensation only, IDM user program
- **4 -** atmospheric pressure & background gas compensation, IDM user program.

Note: *If Package Option B=5 (Rack Mount) is selected, Comp/Comm Option D must be either 3 or 4.*

E: *Wetted Material*

- **1 -** 316 stainless steel
- **2 -** Hastelloy C276 / Chemraz O rings

5.5.1 Calibration Specification

A	B	C
XMO2 -		

A: *Transmitter Model*

XMO2

B: *Range of Oxygen Output*

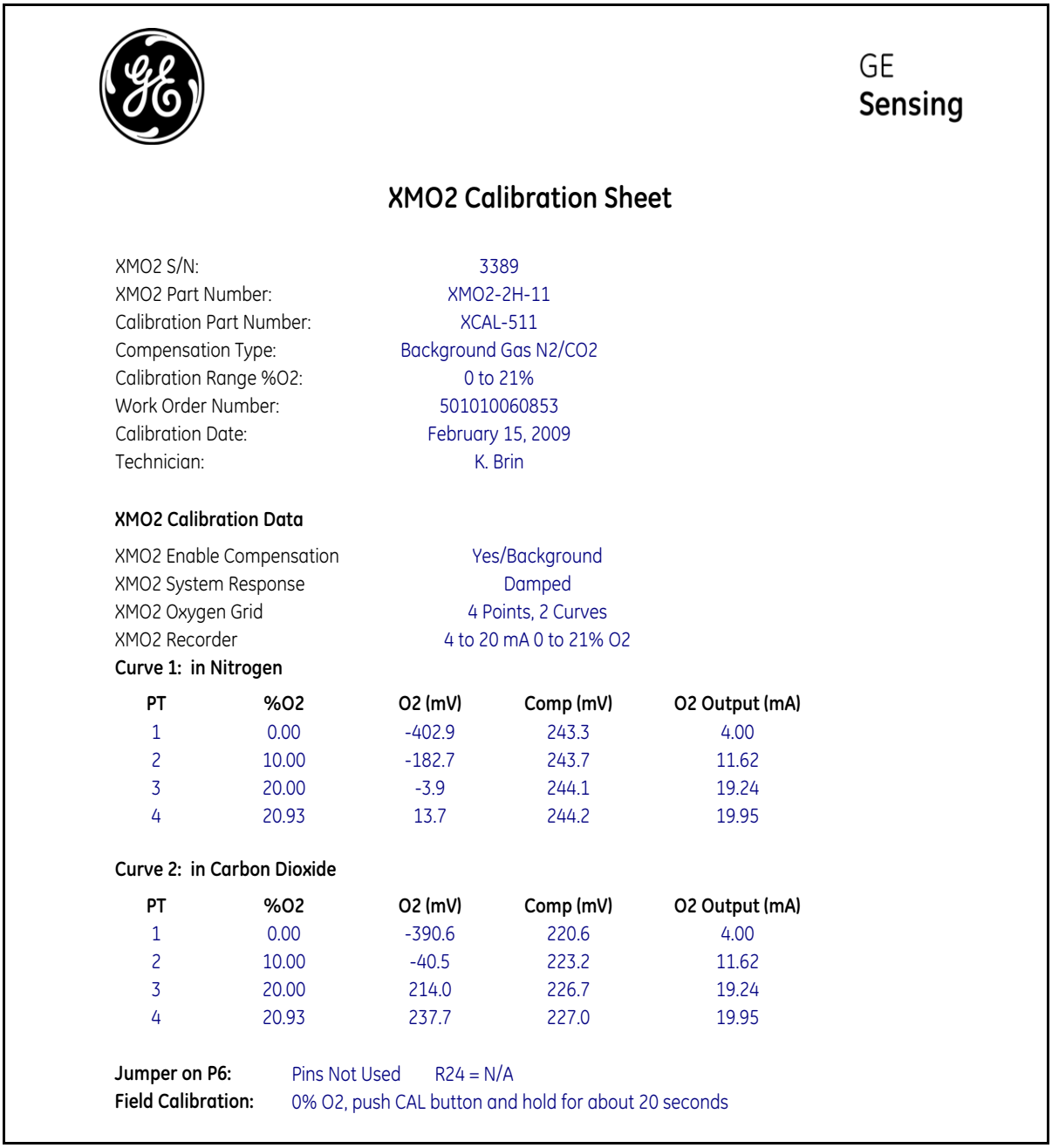
- **1 -** 0-1%
- **2 -** 0-2%
- **3 -** 0-5%
- **4 -** 0-10%
- **5 -** 0-21%
- **6 -** 0-25%
- **7 -** 0-50% (atmospheric pressure compensation XMO2 hardware required)
- **8 -** 0-100% (atmospheric pressure compensation XMO2 hardware required)
- **A -** 90-100% (atmospheric pressure compensation XMO2 hardware required)
- **B -** 80-100% (atmospheric pressure compensation XMO2 hardware required)
- **S -** Special

C: *Compensation Signal*

- **1 -** Background gas only (standard gas N_2/CO_2)
- **2 -** Atmospheric pressure only (standard pressure range of 700-800 mm of Hg)
- **3 -** Background gas only (special gas)
- **4 -** Atmospheric pressure only (special range)
- **5 -** Background gas and atmospheric pressure (standard gas N_2/CO_2 and standard pressure range of 700-800 mm of Hg)
- **7 -** 0, 2, 10, 21% O_2 in N_2 and 14% CO_2/N_2
- **S -** Background gas and atmospheric pressure (special gas and special pressure range)

5.6 A Calibration Sheet

For reference, a sample Calibration Sheet for the XMO2 transmitter is shown in Figure 58 below.



GE
Sensing

XMO2 Calibration Sheet

XMO2 S/N:	3389
XMO2 Part Number:	XMO2-2H-11
Calibration Part Number:	XCAL-511
Compensation Type:	Background Gas N2/CO2
Calibration Range %O2:	0 to 21%
Work Order Number:	501010060853
Calibration Date:	February 15, 2009
Technician:	K. Brin

XMO2 Calibration Data

XMO2 Enable Compensation	Yes/Background
XMO2 System Response	Damped
XMO2 Oxygen Grid	4 Points, 2 Curves
XMO2 Recorder	4 to 20 mA 0 to 21% O2

Curve 1: in Nitrogen

PT	%O2	O2 (mV)	Comp (mV)	O2 Output (mA)
1	0.00	-402.9	243.3	4.00
2	10.00	-182.7	243.7	11.62
3	20.00	-3.9	244.1	19.24
4	20.93	13.7	244.2	19.95

Curve 2: in Carbon Dioxide

PT	%O2	O2 (mV)	Comp (mV)	O2 Output (mA)
1	0.00	-390.6	220.6	4.00
2	10.00	-40.5	223.2	11.62
3	20.00	214.0	226.7	19.24
4	20.93	237.7	227.0	19.95

Jumper on P6: Pins Not Used R24 = N/A
Field Calibration: 0% O2, push CAL button and hold for about 20 seconds

Figure 58: Sample XMO2 Calibration Sheet

Appendix A. Two Typical Applications

A.1 Blanketing Gases in Hydrocarbon Liquid Storage Tanks

The XMO2 transmitter and its associated sample system is often used to measure the concentration of oxygen (O_2) in the nitrogen (N_2) or carbon dioxide (CO_2) gases used to blanket hydrocarbon liquids during storage.

A.1.1 The Problem

Air can leak into the vapor space above hydrocarbon liquids stored in tanks or process vessels, forming a potentially explosive gas mixture. To solve this problem, inert gases such as N_2 or CO_2 are often used to purge the vapor space above the stored liquid and dispel any O_2 that may have leaked into that space. In such a system, one must constantly monitor the level of O_2 in the vapor space to make sure that an explosive gas mixture does not form.

A.1.2 Equipment Used

A typical instrumentation package for this application includes an XMO2 transmitter configured for a range of 0-21% O_2 in N_2 or CO_2 and operating conditions of ambient temperature and atmospheric pressure. The XMO2 is mounted in a sample system similar to the one shown in Figure 59 below (dwg. #731-559).

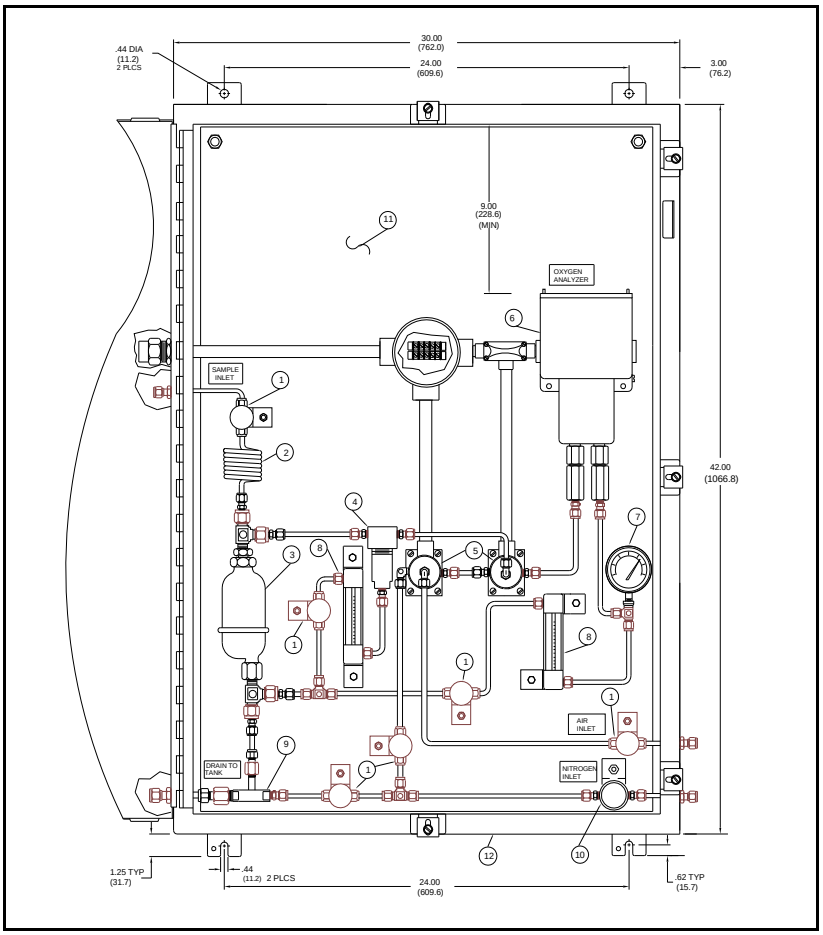


Figure 59: Blanketing Gas Sample System

A.1.2 Equipment Used (cont.)

The sample system in Figure 59 on page 65 consists of:

- an eductor to draw the sample from and return it to the vapor space above the liquid in the storage tank
- a liquid separator/dump to remove condensable liquids
- a filter/coalescer for the removal of solid and liquid particulates
- automatic calibration gas solenoid valves for the automatic calibration of the system on a timed basis
- flowmeters
- pressure gauges

All components are mounted on a painted steel plate that is usually housed in a heated enclosure.

Note: *An optional TMO2D display/controller (or similar device) is required for automatic calibration of the XMO2.*

A.1.3 Basic Operating Procedure

The sample system should be located at or near the top of the storage tank so that condensate can drip back into the tank. The gas used to purge the tank provides the motive force in the eductor to pull a gas sample from the vapor space above the hydrocarbon liquid into the sample system. The sample gas, condensed liquids, and the inert gas are all returned to the tank, making this is a closed-loop system. The XMO2 is recalibrated periodically using the purge gas to zero the instrument and ambient air (20.93% O_2) to span the instrument. The span gas can optionally be vented to atmosphere, so that air is not introduced into the storage tank.

For this application the required calibration gases are:

- *Zero Gas:* N_2 or CO_2 (at least 99.95% pure)
- *Span Gas:* air (20.93% O_2)

A.1.4 Previous Systems

Electrolytic cells were once commonly used for this application. However, such systems required extensive maintenance and frequent manual calibration. In addition, the cells were easily damaged by condensable liquids, requiring frequent cell replacement. As the XMO2 provides continuous monitoring of the O_2 content with maintenance-free operation, it is now the system of choice.

A.2 Reactor Feed Gases in Formaldehyde Production

The XMO2 transmitter and its associated sample system is often used to measure the concentration of oxygen (O_2) in an air/methanol (CH_3OH) vapor mixture that is commonly used as a reactor feed gas in the production of formaldehyde.

A.2.1 The Problem

In order to maximize the yield of the reaction, while maintaining the O_2 concentration at a safe level, the air/CH_3OH vapor mixture must be continuously monitored and accurately controlled.

A.2.2 Equipment Used

A typical instrumentation package for this application includes an XMO2 transmitter configured for a range of 0-21% O_2 in N_2 or CO_2 and operating conditions of a controlled temperature and atmospheric pressure. The XMO2 is mounted in a sample system similar to the one shown in Figure 60 below (dwg. #731-185).

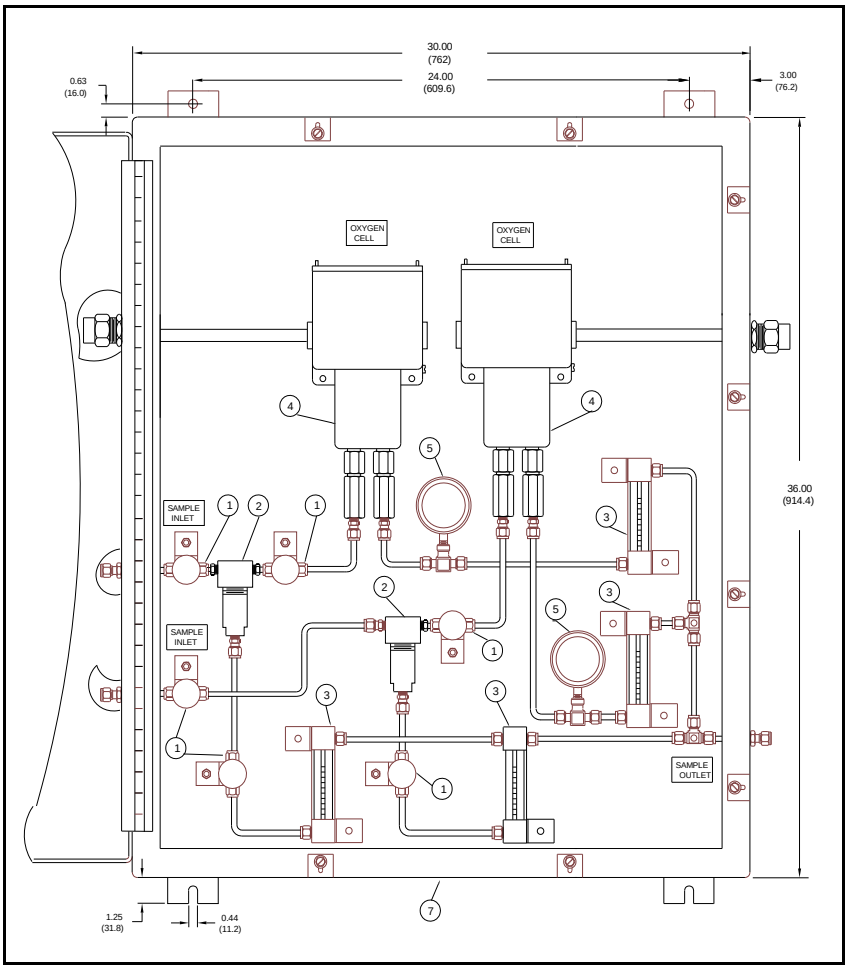


Figure 60: Formaldehyde Feed Gas Sample System

A.2.2 Equipment Used (cont.)

The sample system in Figure 60 on page 67 consists of:

- inlet, outlet, and calibration needle valves
- a filter/coalescer assembly
- pressure gauges
- flowmeters

All components are mounted on a painted steel plate in an enclosure that is heated to 75 ±10°F.

A.2.3 Basic Operating Procedure

The sample system should be mounted as close as possible to the reactor inlet in order to minimize lag time. Air (20.93% O_2) is used as the source of O_2, and the air/CH_3OH vapor mixture is sampled at the reactor inlet. The XMO2 continuously verifies that the optimal amount of O_2 (typically 9.8%) is present for the reaction to proceed safely to a maximized yield. Too low an O_2 level will decrease the yield, while too high an O_2 level will create a safety hazard.

For this application the required calibration gases are:

- *Zero Gas:* N_2 (at least 99.95% pure - 0.0% O_2)
- *Span Gas:* air (20.93% O_2)

Note: *Any compatible display device may be specified.*

A.2.4 Previous Systems

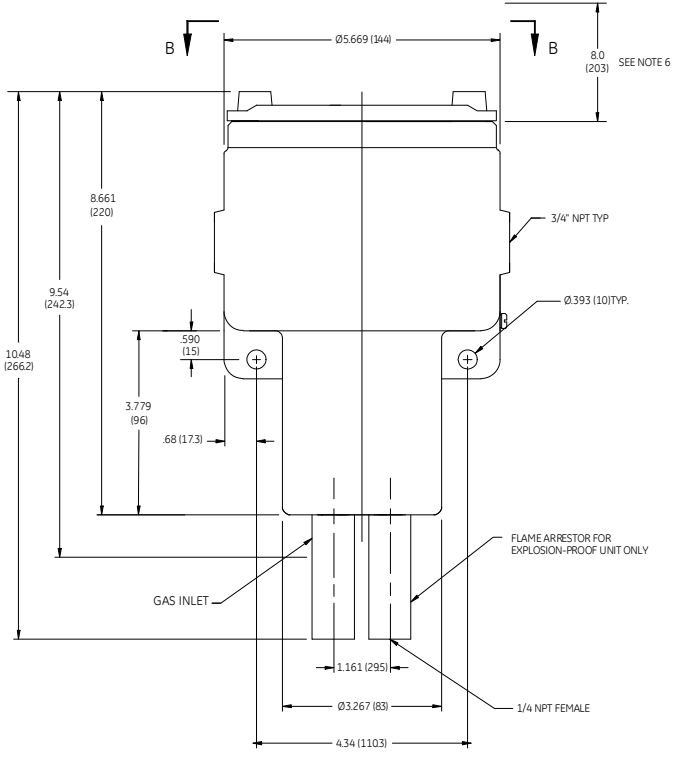
Dumbbell-type paramagnetic O_2 sensors were once commonly used for this application. However, such systems required extensive maintenance and frequent manual calibration. In addition, the sensors were easily damaged by condensable liquids, requiring frequent sensor replacement. As the XMO2 provides continuous, accurate monitoring of the reactor feed gas O_2 content with maintenance-free operation and excellent calibration stability, it is now the system of choice.

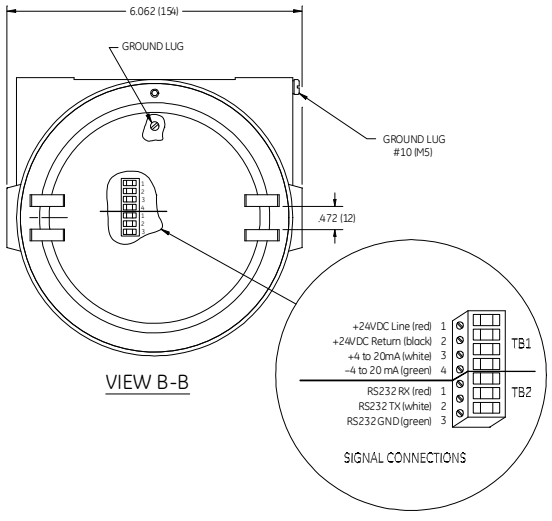
Appendix B. Outline and Installation Drawings

This appendix includes the following XMO2 drawings in 11” x 17” fold-out format:

- Figure 61, "Outline and Installation Drawing" on page 71
- Figure 62, "Oxygen Analyzer Top Assembly (ref. dwg #705-677)" on page 72
- Figure 64, "RS232 Digital Output Cables" on page 74
- Figure 65, "Digital PCB Assembly (ref. dwg #703-1316, rev. K, sh.1)" on page 75
- Figure 66, "Digital PCB Assembly (ref. dwg #703-1316, rev. K, sh. 2)" on page 76
- Figure 67, "Digital PCB Schematic (ref. dwg #700-1316, rev. H, sh. 1)" on page 77
- Figure 68, "Digital PCB Schematic (ref. dwg #700-1316, rev. H, sh. 2)" on page 78
- Figure 69, "Analog PCB Assembly (ref. dwg #703-1276, rev. H,)" on page 79
- Figure 70, "Analog PCB Schematic (ref. dwg #700-1276, rev. F, sh. 1)" on page 80
- Figure 71, "Analog PCB Schematic (ref. dwg #700-1276, rev. F, sh. 2)" on page 81
- Figure 72, "EMI Filter PCB Assembly (dwg. #703-1550, rev. A)" on page 82
- Figure 73, "EMI Filter PCB Schematic (dwg.#700-1550, rev. A)" on page 83

[no content intended for this page - proceed to next page]

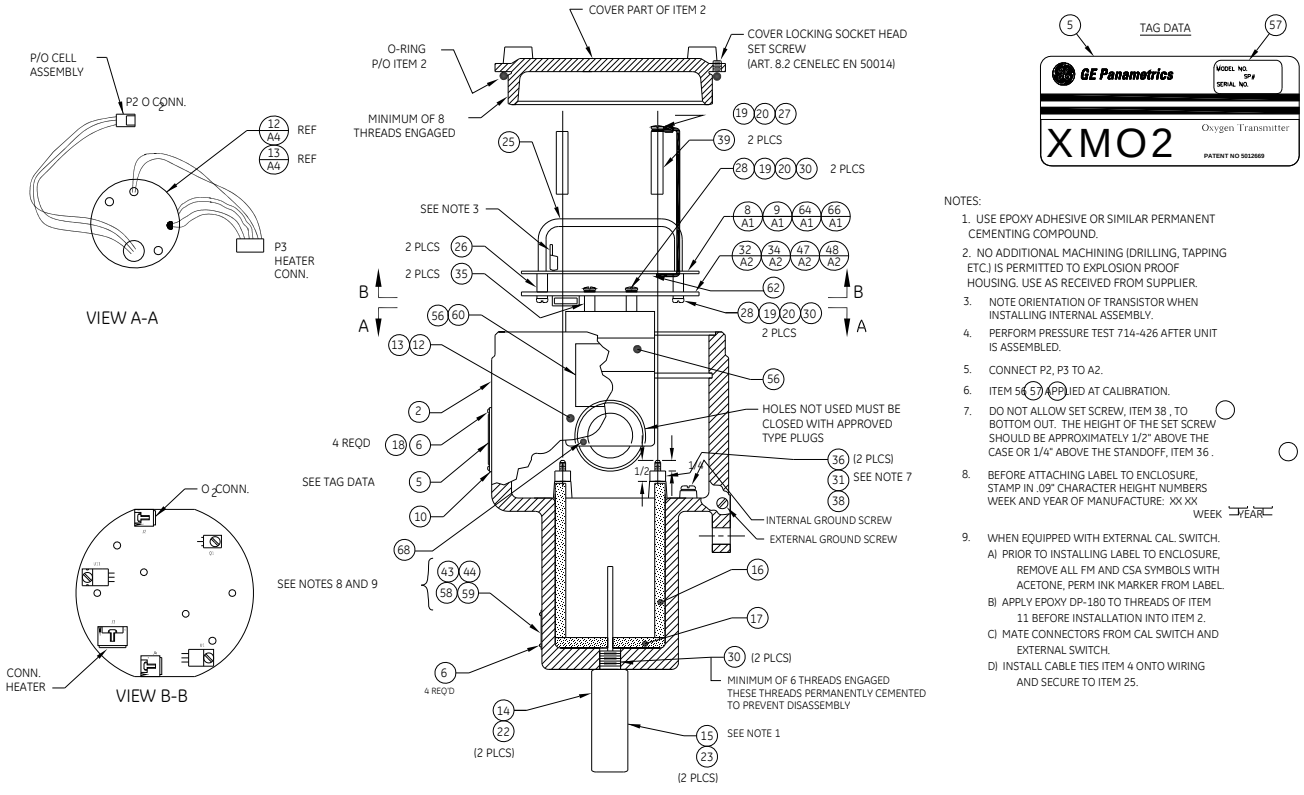




NOTES:

1. ALL DIMENSIONS ARE REFERENCE
2. WEIGHT = 9.5 LBS (4.3 KG)
3. DIMENSIONS ARE IN INCHES (MILLIMETERS).
4. REFERENCE WIRING DIAGRAMS 701-031, 701-032, 701-033.
5. TO BE INSTALLED IN ACCORDANCE WITH LOCAL SAFETY REQUIREMENTS.
6. ALLOW AT LEAST 8" CLEARANCE FOR REMOVAL OF OXYGEN CELL.

Figure 61: Outline and Installation Drawing



NOTES:

1. USE EPOXY ADHESIVE OR SIMILAR PERMANENT CEMENTING COMPOUND.
2. NO ADDITIONAL MACHINING (DRILLING, TAPPING ETC.) IS PERMITTED TO EXPLOSION PROOF HOUSING. USE AS RECEIVED FROM SUPPLIER.
3. NOTE ORIENTATION OF TRANSISTOR WHEN INSTALLING INTERNAL ASSEMBLY.
4. PERFORM PRESSURE TEST 714-426 AFTER UNIT IS ASSEMBLED.
5. CONNECT P2, P3 TO A2.
6. ITEM 56 57 APPLIED AT CALIBRATION.
7. DO NOT ALLOW SET SCREW, ITEM 38 , TO BOTTOM OUT. THE HEIGHT OF THE SET SCREW SHOULD BE APPROXIMATELY 1/2" ABOVE THE CASE OR 1/4" ABOVE THE STANDOFF, ITEM 36 .
8. BEFORE ATTACHING LABEL TO ENCLOSURE, STAMP IN .09" CHARACTER HEIGHT NUMBERS WEEK AND YEAR OF MANUFACTURE: XX XX WEEK YEAR
9. WHEN EQUIPPED WITH EXTERNAL CAL. SWITCH.
   A) PRIOR TO INSTALLING LABEL TO ENCLOSURE, REMOVE ALL FM AND CSA SYMBOLS WITH ACETONE, PERM INK MARKER FROM LABEL.
   B) APPLY EPOXY DP-180 TO THREADS OF ITEM 11 BEFORE INSTALLATION INTO ITEM 2.
   C) MATE CONNECTORS FROM CAL SWITCH AND EXTERNAL SWITCH.
   D) INSTALL CABLE TIES ITEM 4 ONTO WIRING AND SECURE TO ITEM 25.

Figure 62: Oxygen Analyzer Top Assembly (ref. dwg #705-677)

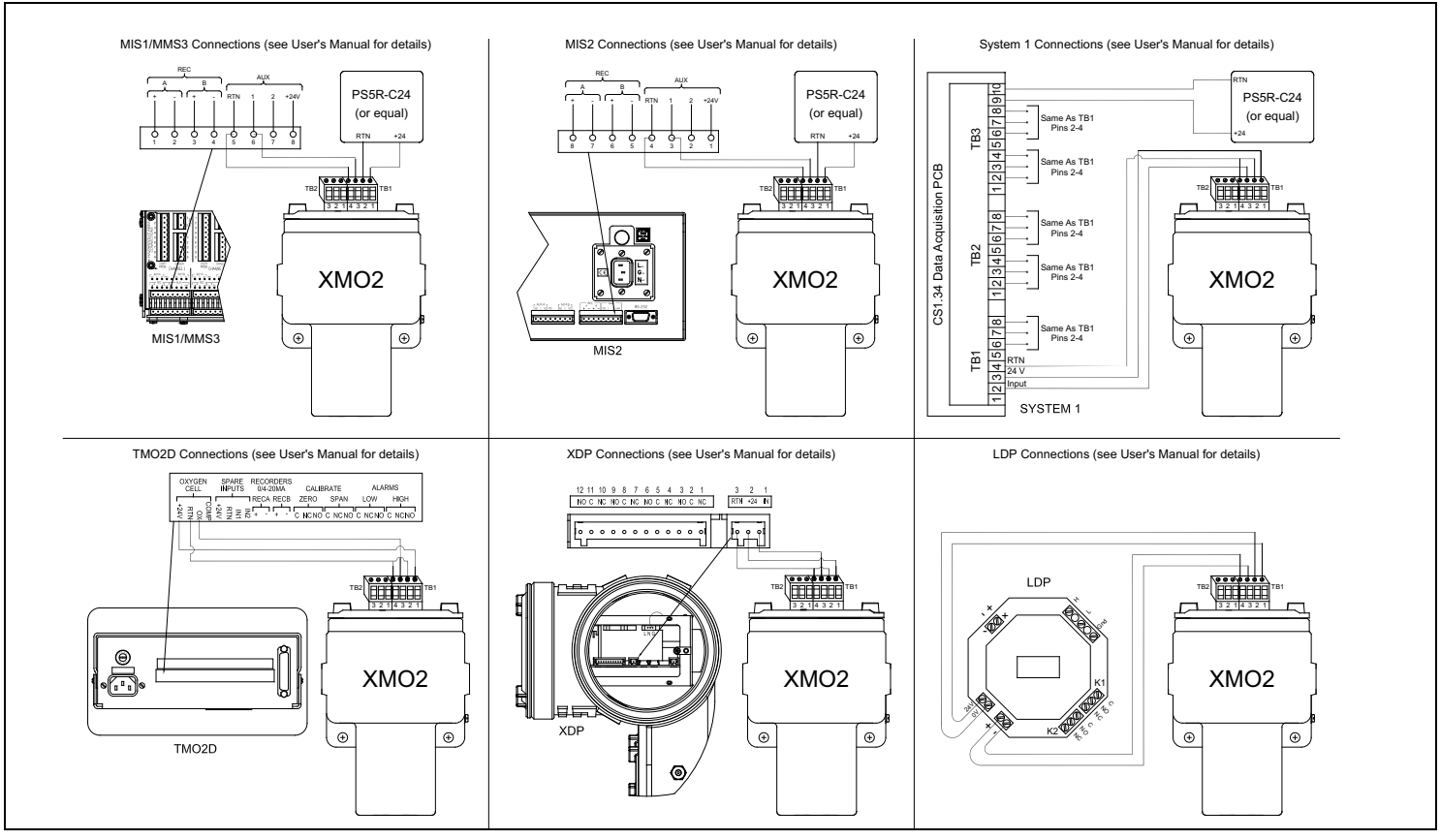
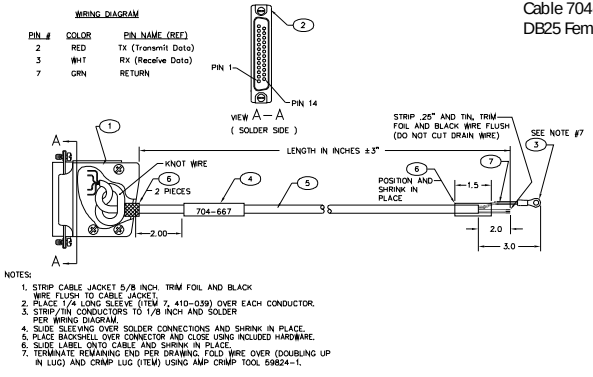
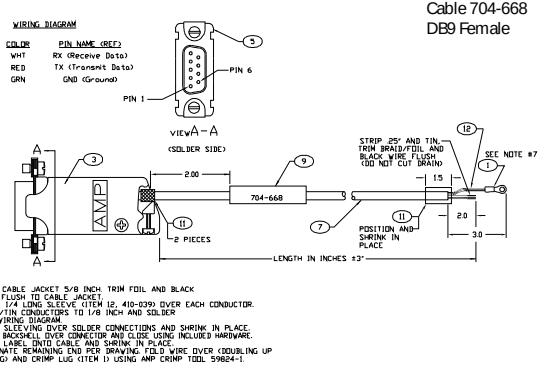
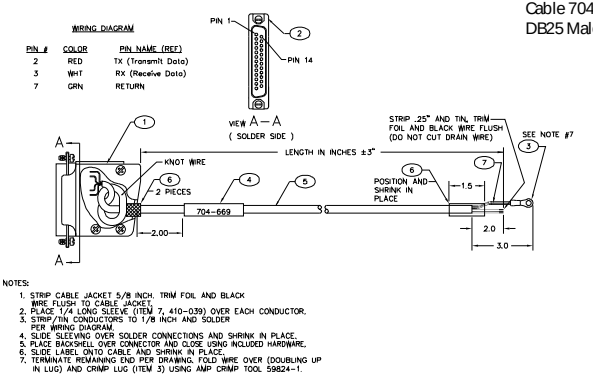


Figure 63: Interconnection Diagrams


Cable 704-667
DB25 Female
WIRING DIAGRAM
PIN # COLOR PIN NAME (REF)
2 RED TX (Transmit Data)
3 WHT RX (Receive Data)
7 GRN RETURN
PIN 1
PIN 14
VIEW A–A
(SOLDER SIDE)
LENGTH IN INCHES ±3"
KNOT WIRE
2 PIECES
704-667
2.00
STRIP .25" AND TIN, TRIM FOIL AND BLACK WIRE FLUSH (DO NOT CUT DRAIN WIRE)
SEE NOTE #7
POSITION AND SHRINK IN PLACE
1.5
2.0
3.0
NOTES:
1. STRIP CABLE JACKET 5/8 INCH. TRIM FOIL AND BLACK WIRE FLUSH TO CABLE JACKET.
2. PLACE 1/4 LONG SLEEVE (ITEM 7, 410-039) OVER EACH CONDUCTOR.
3. STRIP/TIN CONDUCTORS TO 1/8 INCH AND SOLDER PER WIRING DIAGRAM.
4. SLIDE SLEEVING OVER SOLDER CONNECTIONS AND SHRINK IN PLACE.
5. PLACE BACKSHELL OVER CONNECTOR AND CLOSE USING INCLUDED HARDWARE.
6. SLIDE LABEL ONTO CABLE AND SHRINK IN PLACE.
7. TERMINATE REMAINING END PER DRAWING. FOLD WIRE OVER (DOUBLING UP IN LUG) AND CRIMP LUG (ITEM) USING AMP CRIMP TOOL 59824-1.


Cable 704-668
DB9 Female
WIRING DIAGRAM
PIN # COLOR PIN NAME (REF)
2 WHT RX (Receive Data)
3 RED TX (Transmit Data)
5 GRN GND (Ground)
PIN 1
PIN 6
VIEW A–A
(SOLDER SIDE)
2.00
704-668
2 PIECES
STRIP .25" AND TIN, TRIM BRAID/FOIL AND BLACK WIRE FLUSH (DO NOT CUT DRAIN)
SEE NOTE #7
1.5
2.0
3.0
POSITION AND SHRINK IN PLACE
LENGTH IN INCHES ±3"
NOTES:
1. STRIP CABLE JACKET 5/8 INCH. TRIM FOIL AND BLACK WIRE FLUSH TO CABLE JACKET.
2. PLACE 1/4 LONG SLEEVE (ITEM 12, 410-039) OVER EACH CONDUCTOR.
3. STRIP/TIN CONDUCTORS TO 1/8 INCH AND SOLDER PER WIRING DIAGRAM.
4. SLIDE SLEEVING OVER SOLDER CONNECTIONS AND SHRINK IN PLACE.
5. PLACE BACKSHELL OVER CONNECTOR AND CLOSE USING INCLUDED HARDWARE.
6. SLIDE LABEL ONTO CABLE AND SHRINK IN PLACE.
7. TERMINATE REMAINING END PER DRAWING. FOLD WIRE OVER (DOUBLING UP IN LUG) AND CRIMP LUG (ITEM 1) USING AMP CRIMP TOOL 59824-1.


Cable 704-669
DB25 Male
WIRING DIAGRAM
PIN # COLOR PIN NAME (REF)
2 RED TX (Transmit Data)
3 WHT RX (Receive Data)
7 GRN RETURN
PIN 1
PIN 14
VIEW A–A
(SOLDER SIDE)
LENGTH IN INCHES ±3"
KNOT WIRE
2 PIECES
704-669
2.00
STRIP .25" AND TIN, TRIM FOIL AND BLACK WIRE FLUSH (DO NOT CUT DRAIN WIRE)
SEE NOTE #7
POSITION AND SHRINK IN PLACE
1.5
2.0
3.0
NOTES:
1. STRIP CABLE JACKET 5/8 INCH. TRIM FOIL AND BLACK WIRE FLUSH TO CABLE JACKET.
2. PLACE 1/4 LONG SLEEVE (ITEM 7, 410-039) OVER EACH CONDUCTOR.
3. STRIP/TIN CONDUCTORS TO 1/8 INCH AND SOLDER PER WIRING DIAGRAM.
4. SLIDE SLEEVING OVER SOLDER CONNECTIONS AND SHRINK IN PLACE.
5. PLACE BACKSHELL OVER CONNECTOR AND CLOSE USING INCLUDED HARDWARE.
6. SLIDE LABEL ONTO CABLE AND SHRINK IN PLACE.
7. TERMINATE REMAINING END PER DRAWING. FOLD WIRE OVER (DOUBLING UP IN LUG) AND CRIMP LUG (ITEM 3) USING AMP CRIMP TOOL 59824-1.

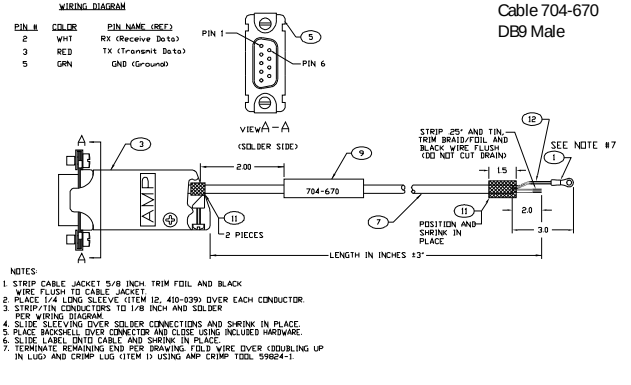
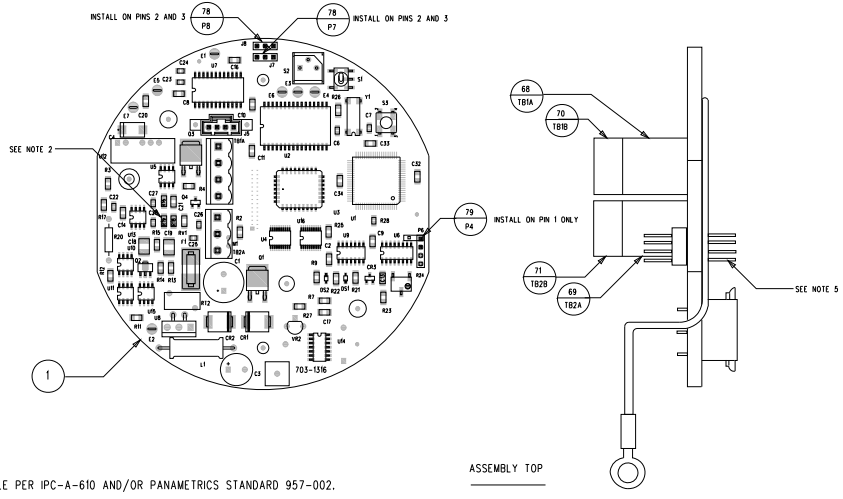

Cable 704-670
DB9 Male
WIRING DIAGRAM
PIN # COLOR PIN NAME (REF)
2 WHT RX (Receive Data)
3 RED TX (Transmit Data)
5 GRN GND (Ground)
PIN 1
PIN 6
VIEW A–A
(SOLDER SIDE)
2.00
704-670
2 PIECES
STRIP .25" AND TIN, TRIM BRAID/FOIL AND BLACK WIRE FLUSH (DO NOT CUT DRAIN)
SEE NOTE #7
1.5
2.0
3.0
POSITION AND SHRINK IN PLACE
LENGTH IN INCHES ±3"
NOTES:
1. STRIP CABLE JACKET 5/8 INCH. TRIM FOIL AND BLACK WIRE FLUSH TO CABLE JACKET.
2. PLACE 1/4 LONG SLEEVE (ITEM 12, 410-039) OVER EACH CONDUCTOR.
3. STRIP/TIN CONDUCTORS TO 1/8 INCH AND SOLDER PER WIRING DIAGRAM.
4. SLIDE SLEEVING OVER SOLDER CONNECTIONS AND SHRINK IN PLACE.
5. PLACE BACKSHELL OVER CONNECTOR AND CLOSE USING INCLUDED HARDWARE.
6. SLIDE LABEL ONTO CABLE AND SHRINK IN PLACE.
7. TERMINATE REMAINING END PER DRAWING. FOLD WIRE OVER (DOUBLING UP IN LUG) AND CRIMP LUG (ITEM 1) USING AMP CRIMP TOOL 59824-1.

Figure 64: RS232 Digital Output Cables



NOTES:

1. ASSEMBLE PER IPC-A-610 AND/OR PANAMETRICS STANDARD 957-002.
2. R19 NOT INSTALLED (SPECIALS ONLY)
3. ALL UNINSTALLED COMPONENT HOLES TO BE SOLDER FREE
4. DISCARD LOCKWASHER AND NUT ON S2 (DO NOT INSTALL)
5. INSTALL P6 WITH LONGER LEADS INTO PCB AS SHOWN FOR PROPER STACKUP WITH MATED ASSEMBLY. SOLDER MUST BE FLUSH TO BOARD. DO NOT CUT, TRIM OR TIN EXCESS LEADS.
6. INSTALL CHASSIS GROUND WIRE ON THE BOTTOM SIDE OF THE PCB. APPLY LOCTITE 416 INSTANT ADHESIVE AND LOCTITE 7452 ACCELERATOR OR EQUIVALENT TO TACK WIRE TO PCB.

GROUPS	
NO.	DESCRIPTION
01	STANDARD
02	02
03	TC

Figure 65: Digital PCB Assembly (ref. dwg #703-1316, rev. K, sh.1)

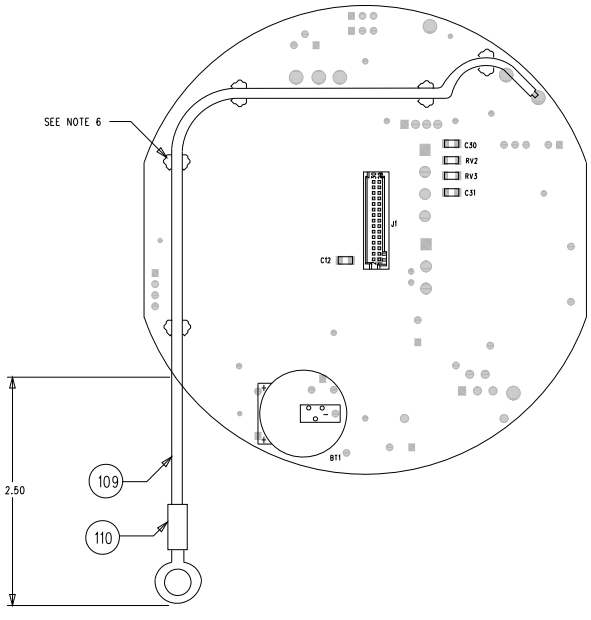


Figure 66: Digital PCB Assembly (ref. dwg #703-1316, rev. K, sh. 2)

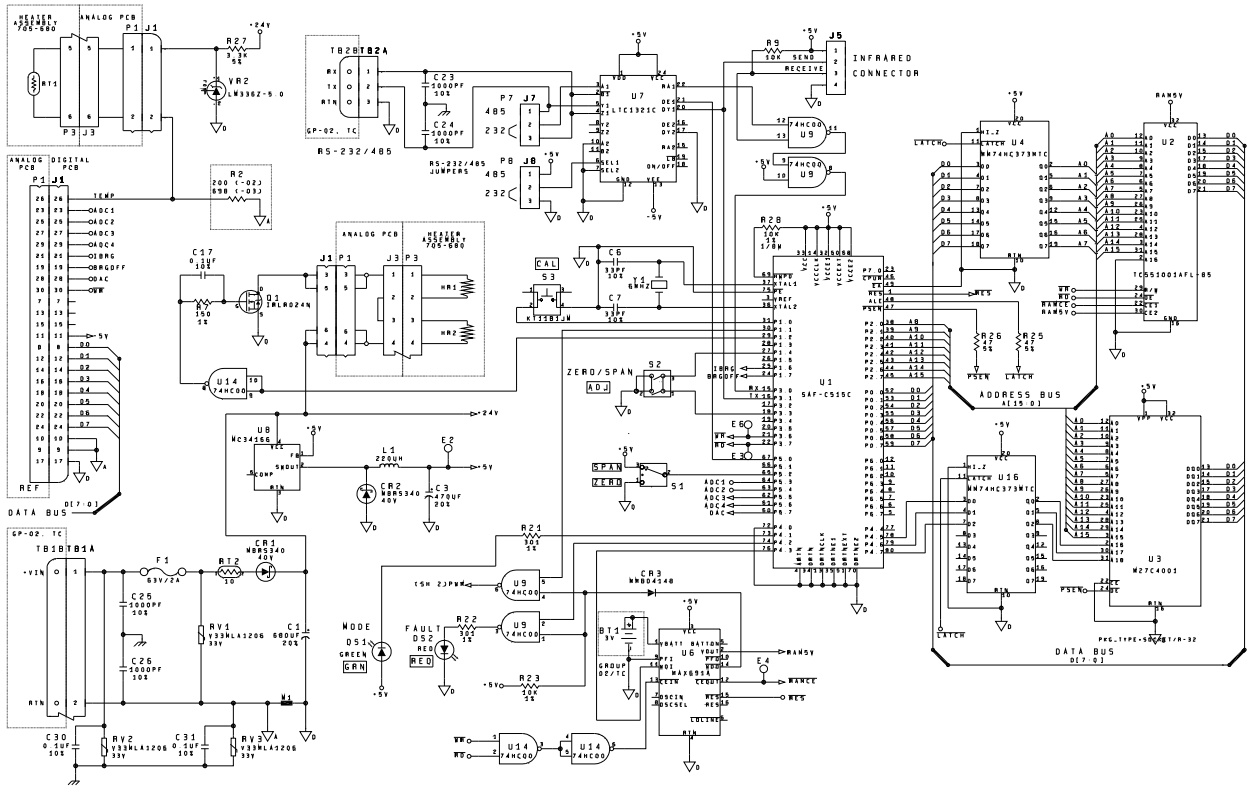


Figure 67: Digital PCB Schematic (ref. dwg #700-1316, rev. H, sh. 1)

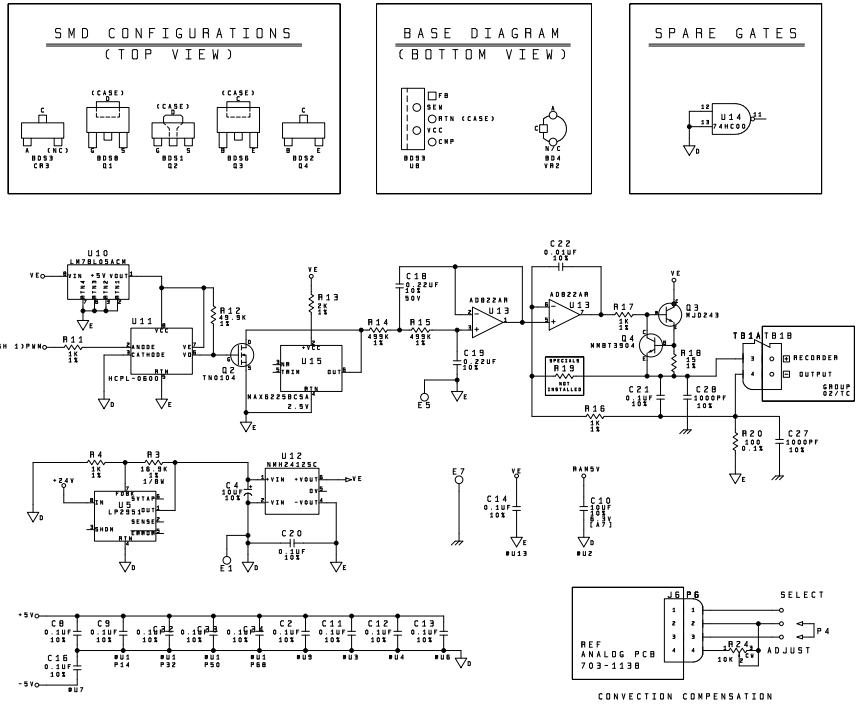
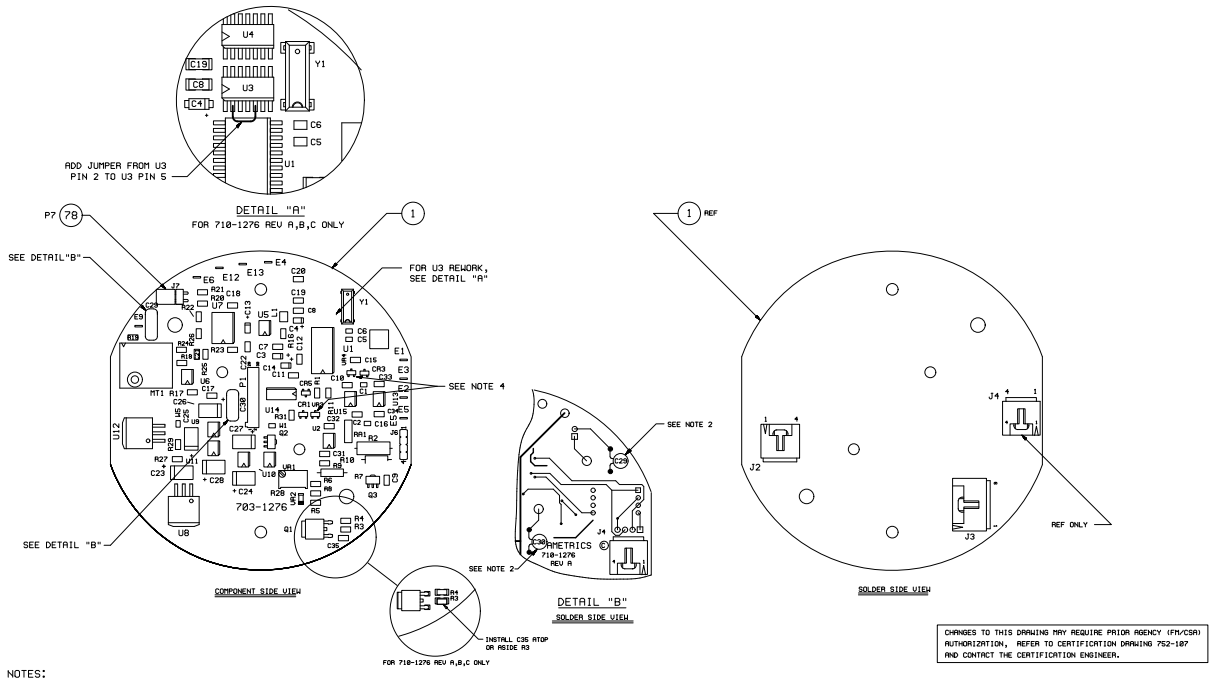


TABLE 1					
POWER CHART					
REF DES	TYPE	+5V	-5V	D	MISC
U9 U14	74HC00	14		7	
U13	ADB22A				8=VE 4=E

TABLE 2	
REF DES CHART	
HIGHEST USED	NOT USED
BT1	
C34	C5 C15 C29
CR3	
DS2	
E7	
F1	
J8	J2 J3 J4 J6
L1	
W1	
P8	P1 P2 P3 P5
Q4	
R28	R1 R5 R6 R8 R10
RT2	RT1
RV3	
S3	
TB2	
U15	
VR2	VR1
Y1	

TABLE 3	
GROUP CHART	
NUMBER	DESCRIPTION
01	STANDARD
02	02
03	TC

Figure 68: Digital PCB Schematic (ref. dwg #700-1316, rev. H, sh. 2)



NOTES:

1. ASSEMBLE PER IPC-A-610 AND/OR PANAMETRICS STANDARD 957-002.
2. INSTALL C29 AND C30 ON SOLDER SIDE OF BOARD AS SHOWN, C29 MAY EXTEND OVER THE EDGE OF THE PCB 0.14" MAX.
3. TRIM J6 AND J7 LEADS TO 0.04 INCHES MAX HEIGHT ABOVE THE PCB.
4. INSTALL VR3 AT CR2 LOCATION AND INSTALL VR4 AT CR4 LOCATION.

GROUPS	
NUMBER	DESCRIPTION
01	STANDARD
02	TC
03	OX
04	OX + PRESS

Figure 69: Analog PCB Assembly (ref. dwg #703-1276, rev. H)

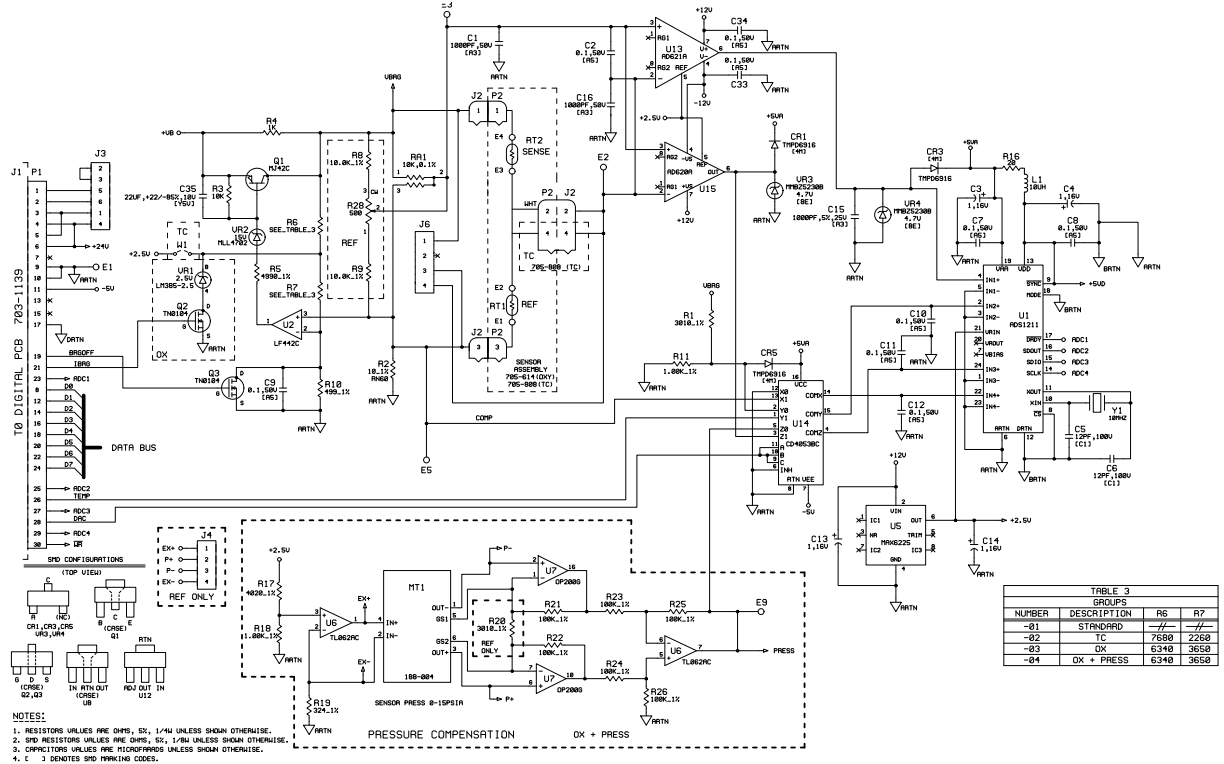

T0 DIGITAL PCB 703-1139
DATA BUS
SMD CONFIGURATIONS
(TOP VIEW)
REF ONLY
PRESSURE COMPENSATION
OX + PRESS
SENSOR ASSEMBLY 705-614(OXY) 705-808(TC)
SENSOR PRESS 0-15PSIA
NOTES:
1. RESISTORS VALUES ARE OHMS, 5%, 1/4W UNLESS SHOWN OTHERWISE.
2. SMD RESISTORS VALUES ARE OHMS, 5%, 1/8W UNLESS SHOWN OTHERWISE.
3. CAPACITORS VALUES ARE MICROFARADS UNLESS SHOWN OTHERWISE.
4. [ ] DENOTES SMD MARKING CODES.
5. IC POWER, LAST USED, AND DECOUPLING CAPACITORS SHOWN ON PAGE 2.

TABLE 3 GROUPS			
NUMBER	DESCRIPTION	R6	R7
-01	STANDARD	-//	-//
-02	TC	7680	2260
-03	OX	6340	3650
-04	OX + PRESS	6340	3650

Figure 70: Analog PCB Schematic (ref. dwg #700-1276, rev. F, sh. 1)

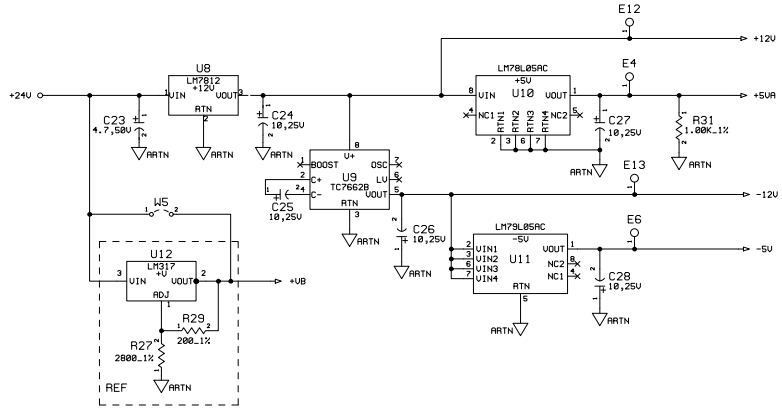


TABLE 1							
POWER CHART							
REFDES	TYPE	+5VA	+5VD	+12V	-12V	BRTN	ARTN
U2	LF442C			8	4		
U6	TL062AC			8	4		
U7	OP200G			13	4		

TABLE 2	
REFDES	
HIGHEST USED	NOT USED
C35	
CR5	CR2,CR4
J7	J5
E13	E7,E8,E10,E11
L1	
MT1	
P7	P3-P6
Q3	
R31	R12-R15,R30
RA1	
U15	U3,U4
VR4	
W5	W2,W3,W4
Y1	

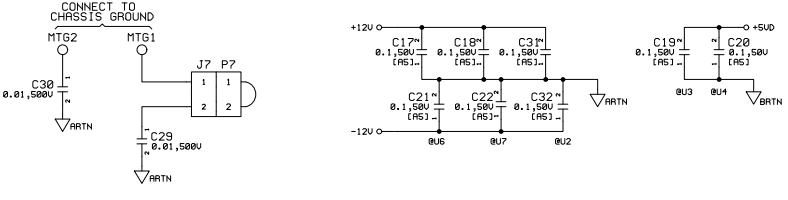
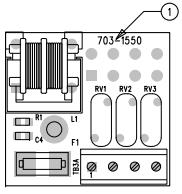
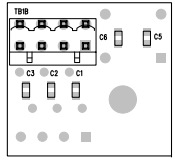


Figure 71: Analog PCB Schematic (ref. dwg #700-1276, rev. F, sh. 2)



ASSEMBLY TOP



BOTTOM SIDE ASSEMBLY

NOTES:

1. ASSEMBLE PER IPC-A-610 AND/OR PANAMETRICS STANDARD 957-002.

Figure 72: EMI Filter PCB Assembly (dwg. #703-1550, rev. A)

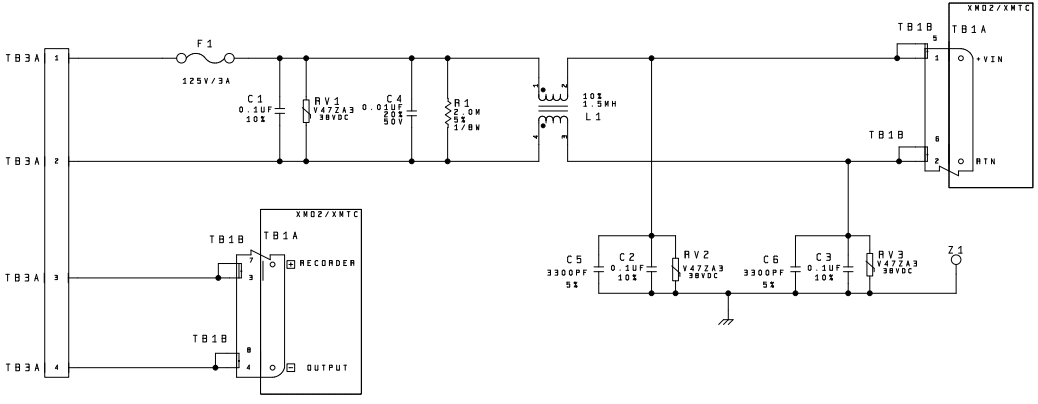


TABLE 1	
REF DES CHART	
HIGHEST USED	NOT USED
C6	
F1	
L1	
R1	
RV3	
TB1B	
TB3A	TB1A TB2A

Figure 73: EMI Filter PCB Schematic (dwg.#700-1550, rev. A)

Appendix C. IDM Menu Maps

This appendix includes the following IDM menu maps:

- Figure 74, “Field Cal, 4-20mA Output and Error Handler Menu Map,” on page 87
- Figure 75, “Factory Cal and Advanced Menu Map,” on page 88

[no content intended for this page - proceed to next page]

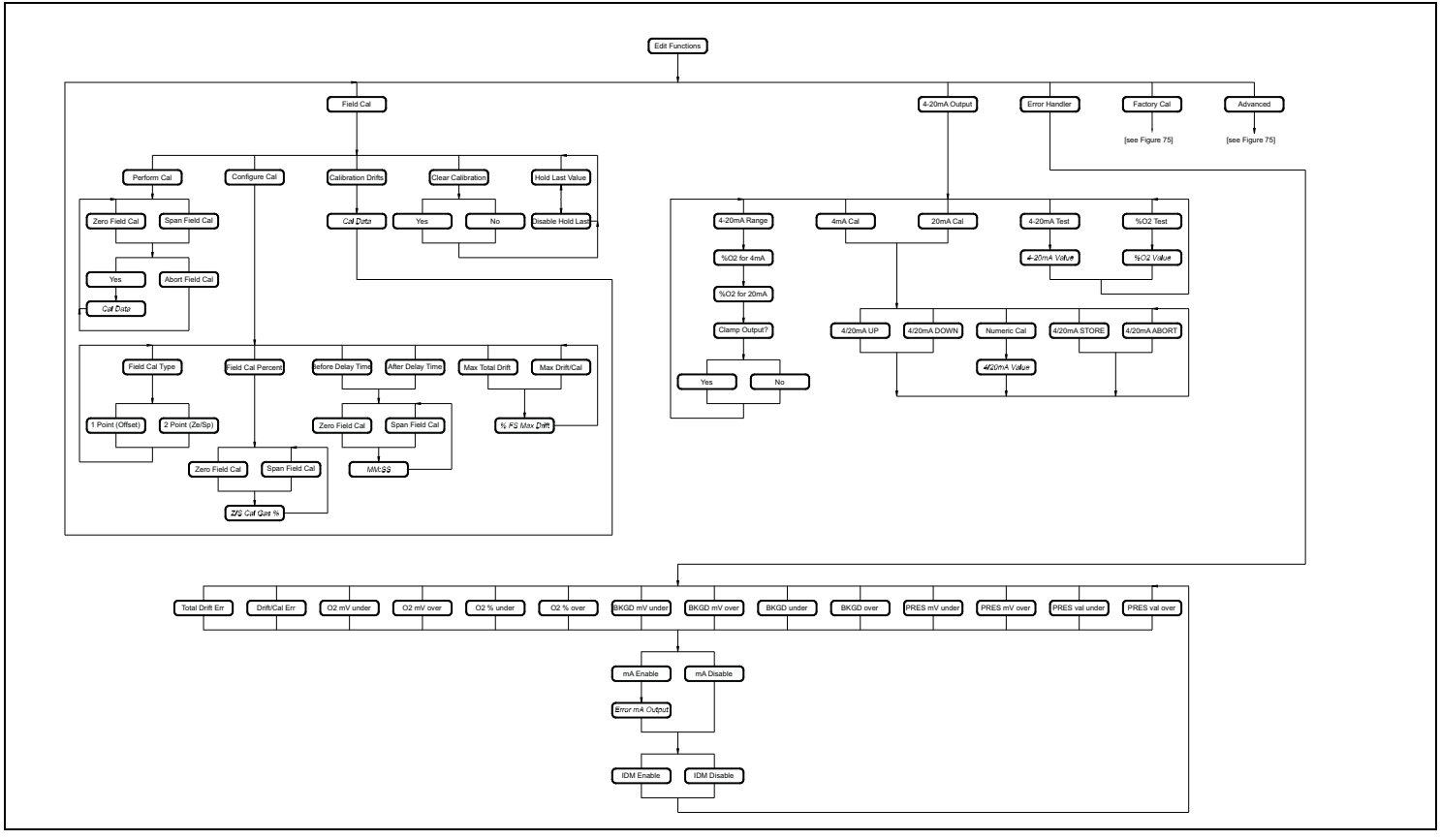


Figure 74: Field Cal, 4-20mA Output and Error Handler Menu Map

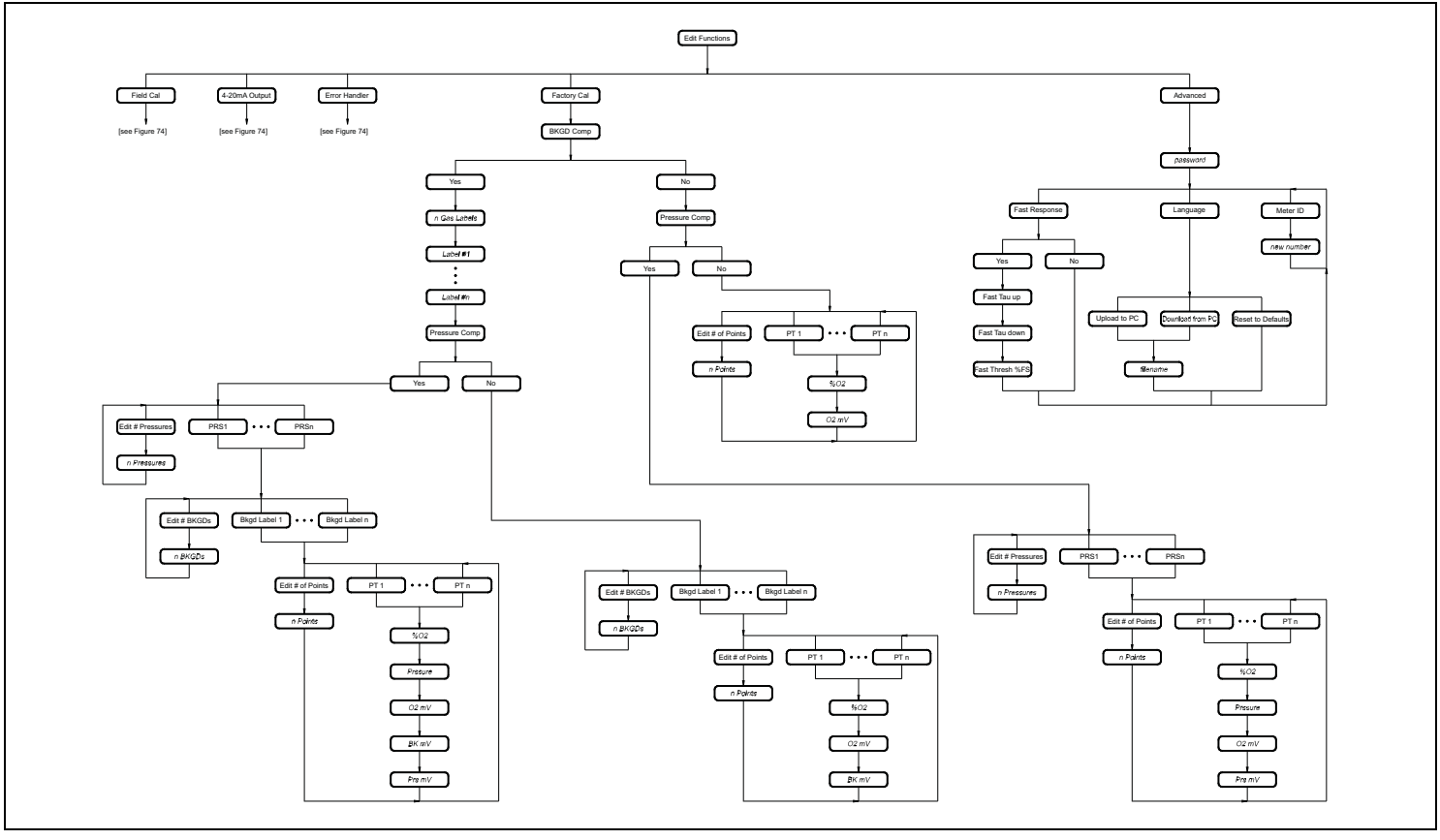


Figure 75: Factory Cal and Advanced Menu Map

Appendix D. Programming with PanaView

D.1 Introduction

The PanaView™ graphical user interface offers interactive communications between Windows-based PCs and GE Sensing instruments compatible with IDM protocol, such as the XMO2 oxygen transmitter. [Compatible 32-bit Windows operating systems include Windows 98SE, NT 4.0 (with Service Pack 6), 2000, XP and ME.] With PanaView, you can:

- load and save site file data
- create and save graph and log files
- display text output and graphs of live measurement data
- create custom templates for displaying text, graph and log data
- interface with multiple GE Sensing instruments.

This document focuses on particular applications suitable for the XMO2 transmitter. For general PanaView applications such as creating graph and log files, displaying live measurement data, and creating custom templates, please refer to the general PanaView *User's Manual* (910-211).

D.2 Wiring the RS232 Interface

All IDM-protocol instruments utilize an RS232 interface to communicate with a PC. For details on wiring your RS232 interface, refer to *Establishing the RS232 Communication Link* on page 16, and the document *EIA-RS Serial Communications* (916-054).

D.3 Setting Up the Communications Port

Use the steps below to establish communications with the XMO2.

1. Open the *"New Meter Browser"* window and expand the network tree. Then, highlight the *My Computer(Name)* branch by clicking on it.
2. Pull down the *"Edit"* menu by clicking on it in the menu bar.
3. Click on the *"New"* menu option to select it, and a submenu opens with two choices on it (see Figure 76 below).

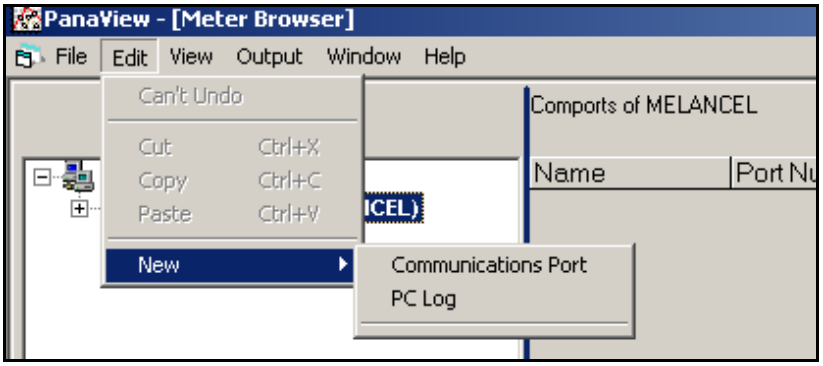


Figure 76: Edit Menu

D.3 Setting Up the Communications Port (cont.)

4. Click on the *"Communications Port"* option to select it. The *Setup Communications* screen appears similar to Figure 77 below.

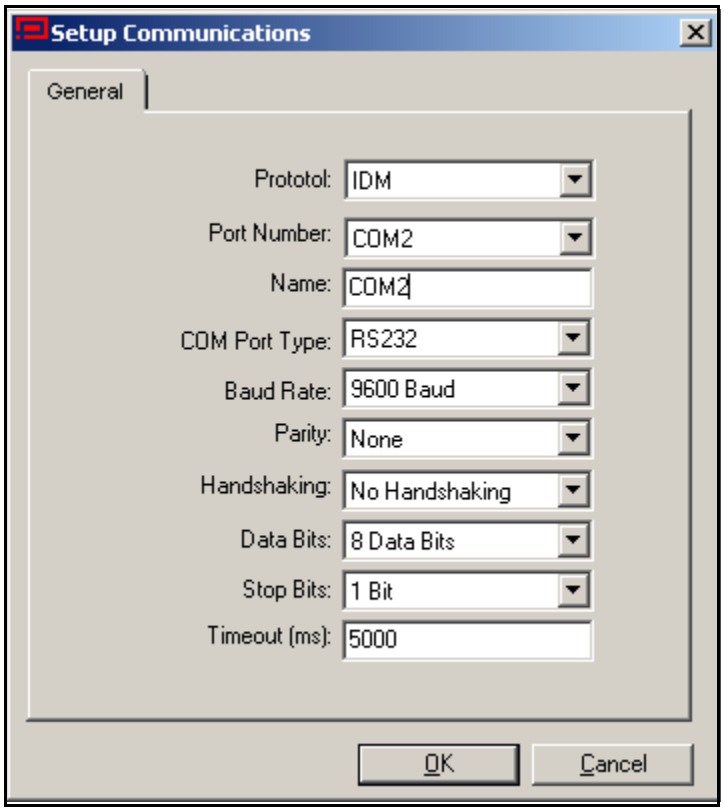


Figure 77: *Setup Communications* Screen

5. Open the Protocol menu (the first of the drop-down menus) and click on *IDM*.

6. Select any suitable available baud rate. A baud rate of 19,200 is appropriate for almost all applications. However, if you experience periodic communication reliability problems, you may wish to consider lowering the baud rate on your instrument and in PanaView.

IMPORTANT: *Be sure all the communications port settings match those made in setting up the meter's serial port.*

7. Click on [OK] to complete data entry.

D.4 Adding the XMO2

To add the XMO2 on the IDM-configured communications port, complete the following steps:

1. Highlight the communication port to which the meter will be added by clicking on it, and then open the *"Edit"* menu on the menu bar (if the communication port is not highlighted first, the *"New Meter"* option is not active in the *"Edit"* menu).
2. Click on the *"New"* option in the *"Edit"* menu (see Figure 78 below).

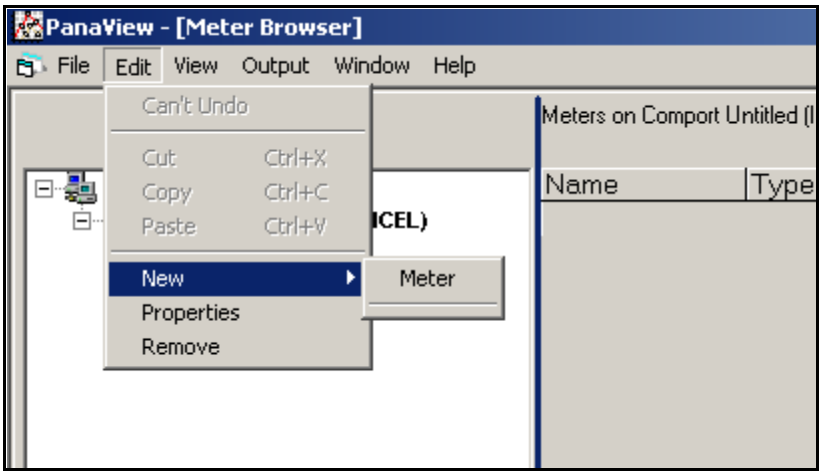


Figure 78: *"New"* Option in the *"Edit"* Menu

3. After clicking on the *"New"* option, the *"Meter"* menu option appears. Click on this option to select it.
4. The *"New IDM Meter"* screen (shown in Figure 79 below) opens. Enter the Network ID number for the meter, and click [OK].

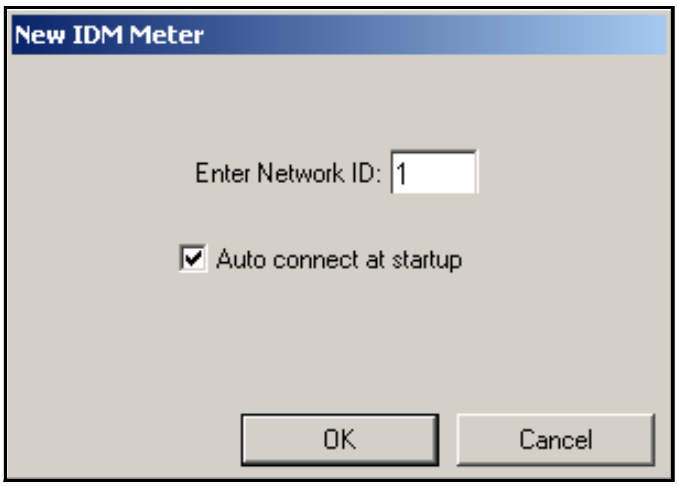


Figure 79: New IDM Meter Screen

D.4 Adding the XMO2 (cont.)

IMPORTANT: *The Network ID number must match the Network ID programmed in the meter's Communications menu.*

If the initialization is successful, the Meter Browser shows a listing similar to Figure 80 below.

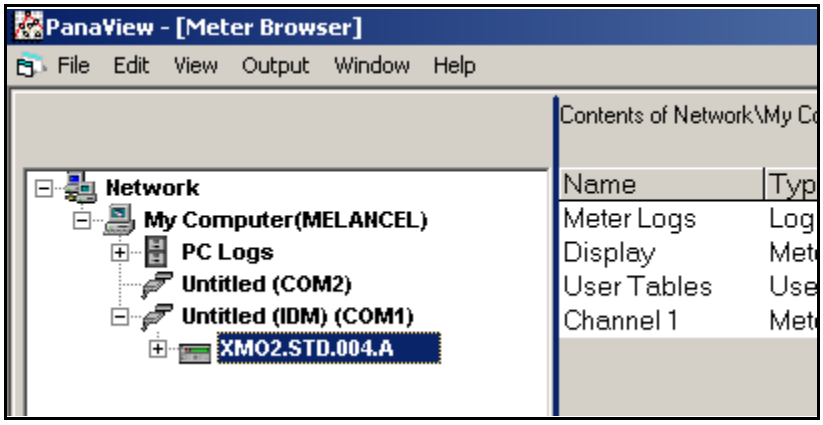


Figure 80: Updated Network Tree

However, if the settings do not match, or there is some other difficulty, a screen appears similar to Figure 81 below.

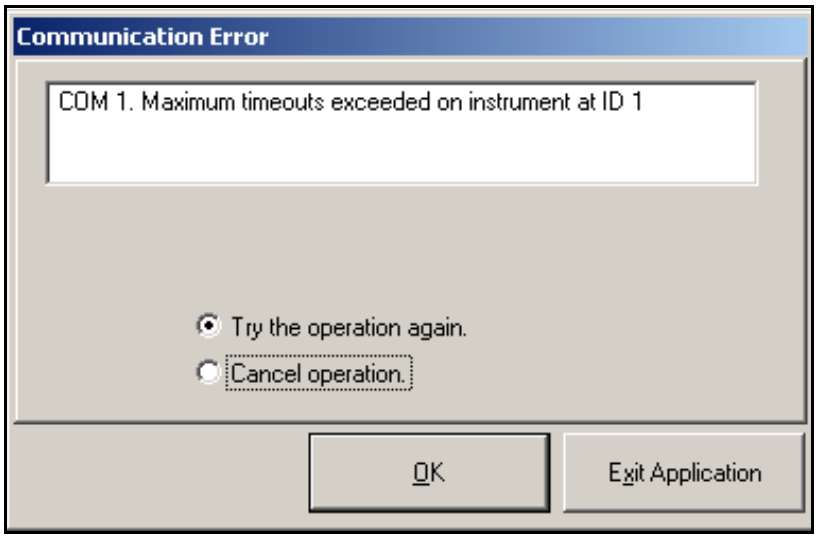


Figure 81: Communication Error Screen

The screen offers the options of trying again or of canceling the operation. Click on the desired choice, and then on [OK] to confirm the choice or on [Exit Application] to close PanaView.

IMPORTANT: *The* Properties *option in the Edit Menu is not applicable to the XMO2.*

D.5 Changing Meter Settings

Through PanaView, XMO2 users can handle remote programming of the meter. They can:

- Program and change a meter's operating parameters;
- Set up, start, and stop logs;
- Calibrate and test inputs and outputs;
- Clear various files.

To access meter programming:

1. Enter the *New Meter Browser* option from the "File" menu.
2. Expand the network tree until you reach the desired meter.
3. Then expand the meter tree as shown in Figure 82 below.

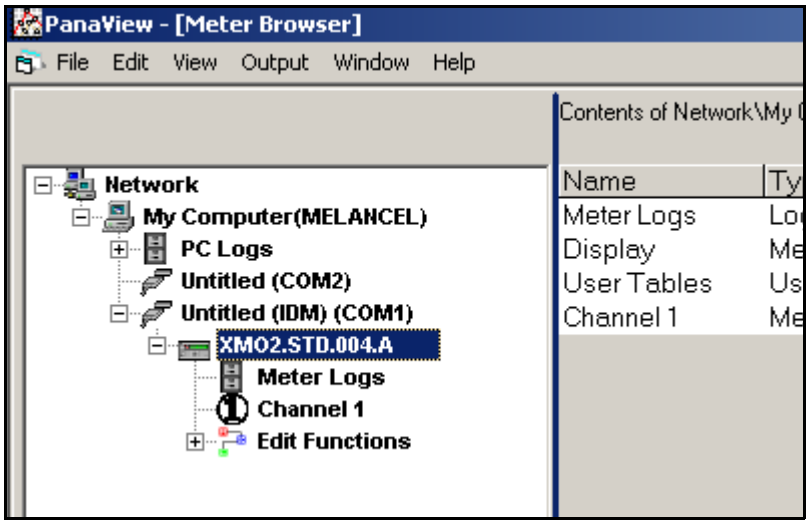


Figure 82: *New Meter Browser* with Meter Branch

D.5 Changing Meter Settings (cont.)

4. From the meter tree, expand the *Edit Functions* option. The window now appears similar to Figure 83 below, with a list of available menus. The five menus listed are those available through the IDM interface, as discussed in Chapters 3 and 4. Refer to the menu maps on Figure 74 on page 87 and Figure 75 on page 88 as a guide to programming.

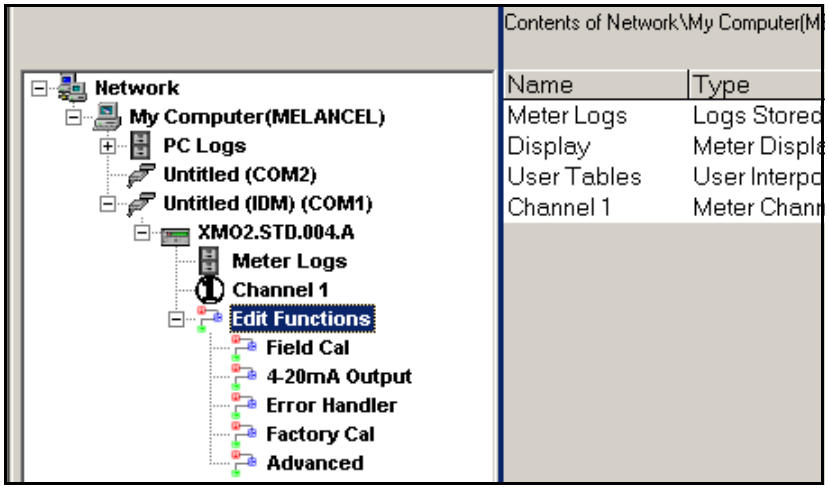


Figure 83: Meter Tree with *Edit Functions* Option

5. To open a particular menu, double-click on that menu on the tree. For example, if you double-click on the *Field Cal* menu, a window opens similar to Figure 84 below.

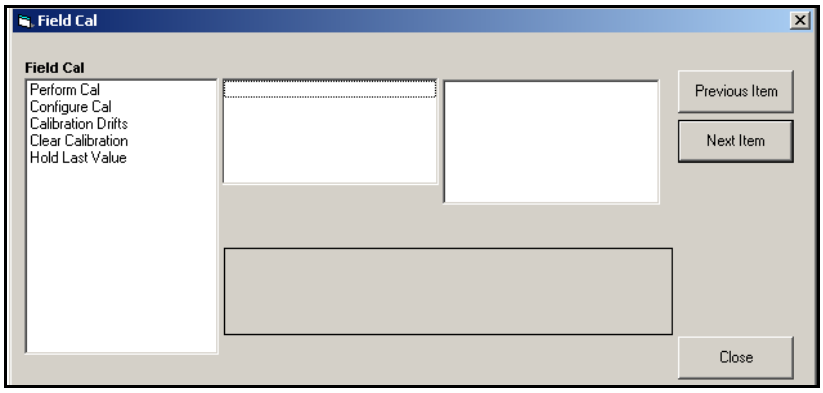


Figure 84: *Field Cal* Window

Note: *For more information about the five menus, please refer to Chapter 3,* Startup & Operation, *and Chapter 4,* Programming with Instrument Data Manager.

D.5 Changing Meter Settings (cont.)

6. To enter a particular option:

a. Highlight and double-click on the desired option in the left pane. Figure 85 below shows the first entry (*Perform Cal*) in the *Field Cal* option. The title above the center pane lists the current entry, while the center pane displays the available selections for that entry.

b. Click on the desired choice; if the entry requires a numeric value, change the value displayed in the right pane.

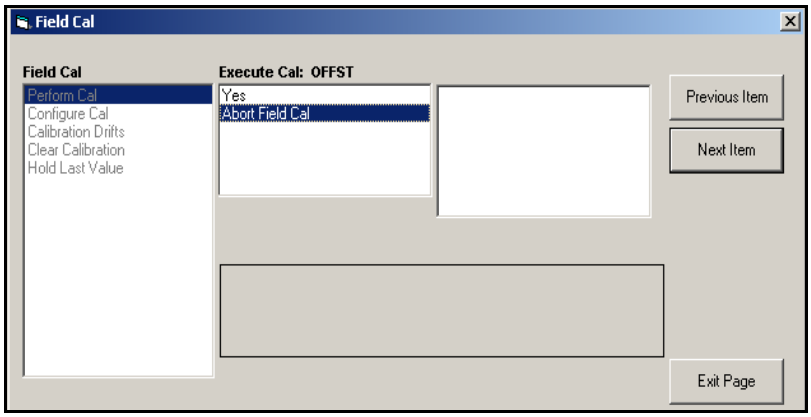


Figure 85: *Perform Cal* Option in the *Field Cal* Menu

c. Do one of the following:

Click on [Next Item] to proceed to the next menu item,

or

Click on [Previous Item] to return back through the menu to a previous item.

Note: *If you click on either [Next Item] or [Previous Item] without changing the settings, the current settings remain unchanged.*

As you step through the menu, the bottom panel lists the current settings (modified or left unchanged), as shown in Figure 86 on page 96. If you modify or step through more than five items, a scroll bar at the right of the panel lets you review the earlier settings.

D.5 Changing Meter Settings (cont.)

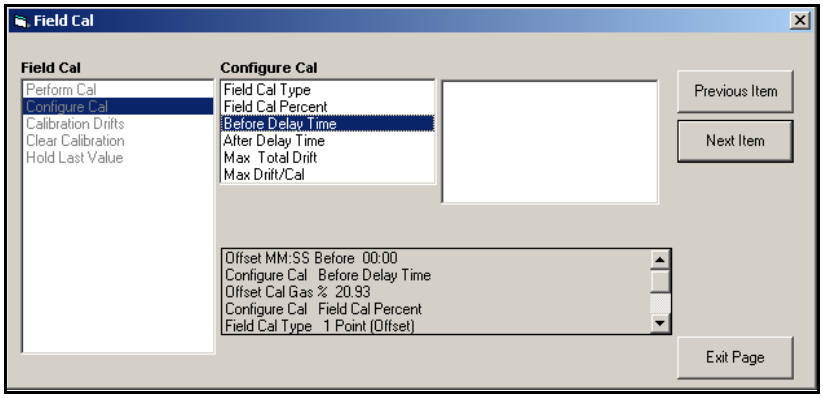


Figure 86: *Field Cal* Menu with Current Settings

7. When you have completed entering parameters in a given option, click [Exit Page] to close the option. You can then double-click on another option, or click [Close] to close the window.

You can double-click on another menu to modify its settings, or return to the *New Meter Browser.* For additional PanaView functions, refer to the PanaView *User's Manual.*

Appendix E. CE Mark Compliance

E.1 CE Mark Requirements

WARNING! CE MARK COMPLIANCE IS REQUIRED FOR ALL UNITS INSTALLED IN EU and EEA COUNTRIES.

WARNING! TO MEET CE MARK REQUIREMENTS, YOU MUST SHIELD AND GROUND ALL ELECTRICAL CABLES AS DESCRIBED IN THIS SECTION (see *Table 5* below).

Note: *If you follow the instructions in this section, your unit will comply with the 2004/108/EC EMC Directive.*

Table 5: Wiring Requirements for CE Mark Compliance

Connection	Termination Modification
Power/Analog Output	1. When connecting the line power/analog output cable, select the cable entry closest to the terminal blocks. 2. Use shielded cable*, such as GE P/N X4(*) or equivalent, to connect the line power and the 4-20 mA analog output device to the XMO2. 3. Terminate the shield to the recommended cable gland, GE P/N 419-215.
RS232 Output	1. Use shielded cable*, such as GE P/N 704-668-12 or equivalent, to interconnect the XMO2 enclosure with any external I/O devices. 2. Terminate the shield to the recommended cable gland, GE P/N 419-215.
*Wires enclosed in a properly-grounded metal conduit do not require additional shielding.	

WARNING! Cable entries of an approved flameproof design are required. These must be installed according to the manufacturer's instructions. The choice of cable entry device may limit the overall installation category achieved.

WARNING! It is the responsibility of the user to ensure that all cable entry devices and covers are properly installed and secure prior to applying power to the XMO2.

E.2 EMI Filter Board

For CE compliance, an *EMI filter board* has been added to the XMO2 (see *Figure 87* below). This board is connected internally to terminal block **TB1**. The *power* and *analog output* connections are now made to terminal block **TB3** on the EMI filter board. The RS232 *digital output* connections are made to terminal block **TB2**.

CAUTION! **Do not make any connections to unassigned or unused terminals.**

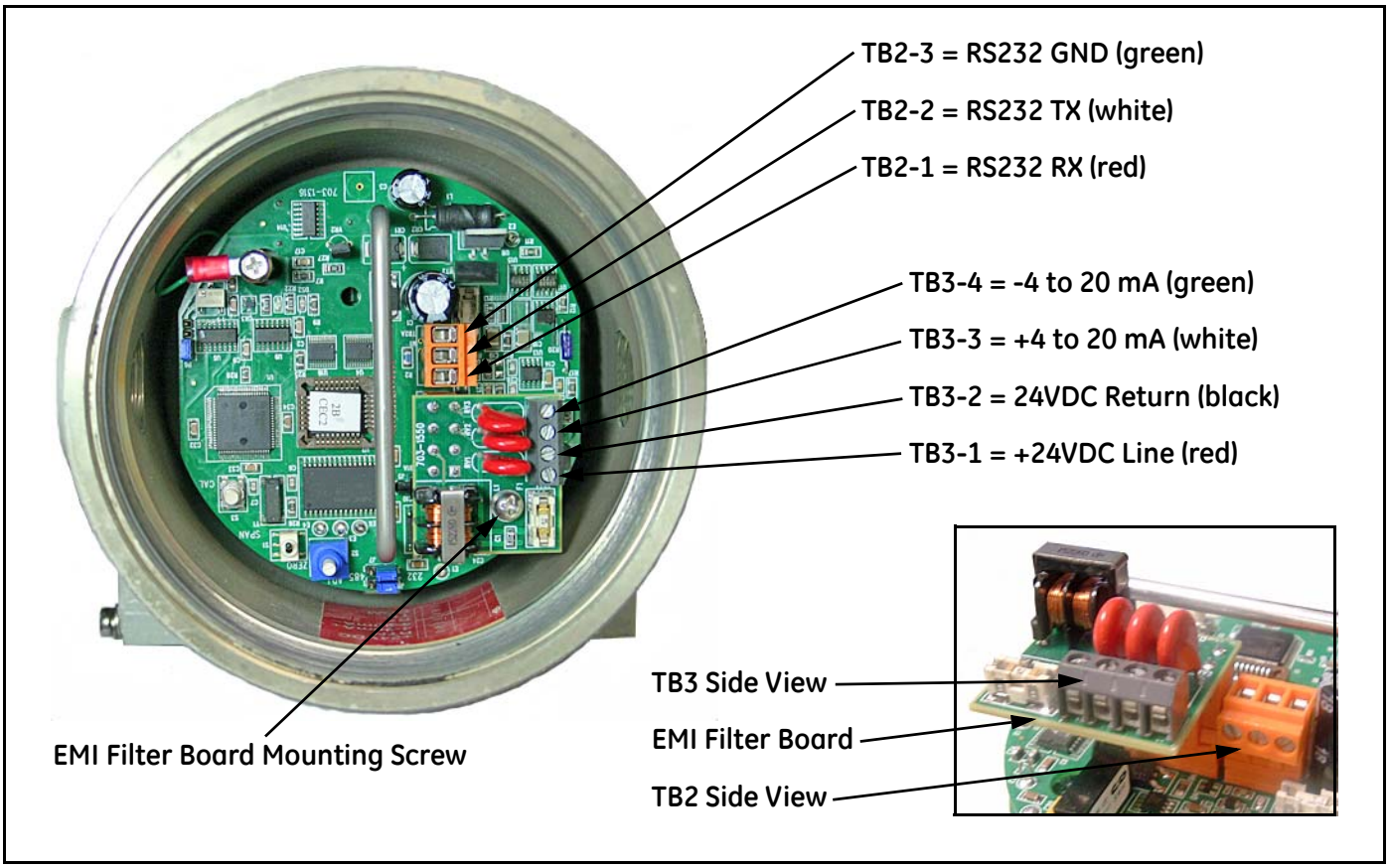

TB2-3 = RS232 GND (green)
TB2-2 = RS232 TX (white)
TB2-1 = RS232 RX (red)
TB3-4 = -4 to 20 mA (green)
TB3-3 = +4 to 20 mA (white)
TB3-2 = 24VDC Return (black)
TB3-1 = +24VDC Line (red)
EMI Filter Board Mounting Screw
TB3 Side View
EMI Filter Board
TB2 Side View

Figure 87: XMO2 with EMI Filter Board - Wiring Connections

E.3 Wiring the Signal Connections

Refer to *Figure 87 on page 98*, and complete the following steps to make the proper wiring connections:

WARNING! Cable entries of an approved flameproof design are required. These must be installed according to the manufacturer's instructions. The choice of cable entry device may limit the overall installation category achieved.

1. Install the first cable entry device in accordance with the manufacturer's instructions.

Note: *If installation of the cable entry device is only partially complete, GE Sensing recommends tagging the device to ensure the safety of subsequent users.*

a. Route the 4-wire power/analog output cable through the cable gland as shown in *Figure 88* below.

b. After terminating the shield as shown, assemble the three gland pieces together and tighten the gland to secure the cable and the shield.

c. Thread the fully-assembled cable gland into the XMO2 port closest to the terminal blocks.

IMPORTANT: *The cable shield must be terminated in the cable gland as shown in* Figure 88 *below.*

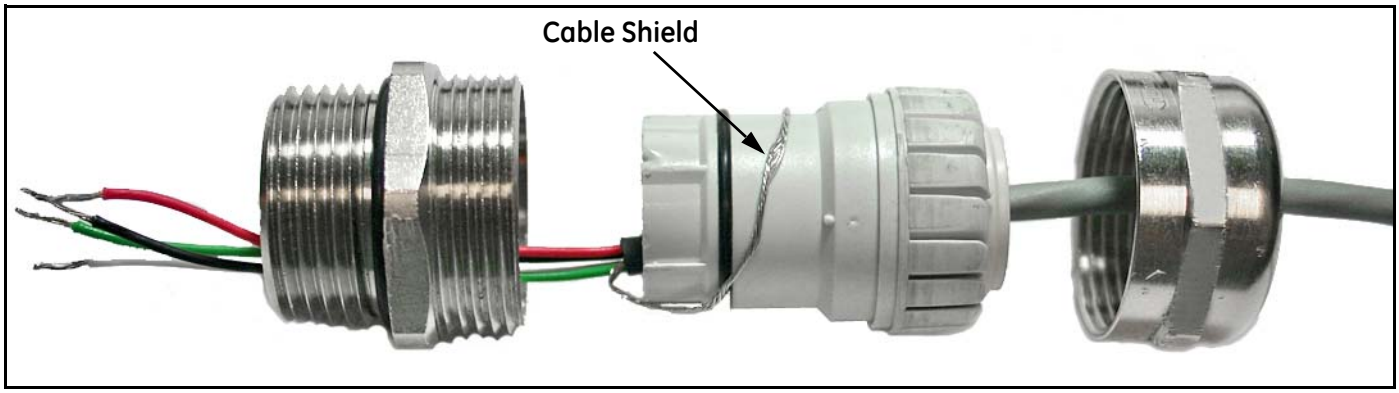


Figure 88: Proper Cable Gland Assembly

2. Remove the screw that secures the EMI filter board to its standoff. Then, pull the board from its socket to access the TB3 connector, and loosen the terminal screws on the TB3 connector.

3. Connect the power leads:

CAUTION! Connecting the +24 VDC line (red) lead to any terminal except TB3-1 will damage the XMO2.

a. Insert the 4-wire cable +24 VDC line (red) lead into pin TB3-1 and tighten the screw.

b. Insert the 4-wire cable 24 VDC return (black) lead into pin TB3-2 and tighten the screw.

4. Connect the analog output leads:

a. Insert the 4-wire cable + 4-20 mA (white) lead into pin TB3-3 and tighten the screw.

b. Insert the 4-wire cable – 4-20 mA (green) lead into pin TB3-4 and tighten the screw.

E.3 Wiring the Signal Connections (cont.)

5. Install the second cable entry device in accordance with the manufacturer's instructions.

Note: *If installation of the cable entry device is only partially complete, GE Sensing recommends tagging the device to ensure the safety of subsequent users.*

a. Route the 3-wire RS232 cable through the cable gland as shown in *Figure 88 on page 99*.

b. After terminating the shield as shown, assemble the three gland pieces together and tighten the gland to secure the cable and the shield.

c. Thread the fully-assembled cable gland into the remaining XMO2 port.

IMPORTANT: *The cable shield must be terminated in the cable gland as shown in* Figure 88 on page 99.

6. Unplug the TB2 connector by pulling it straight out of its socket, and loosen the terminal screws on the TB2 connector.

7. Connect the RS232 serial port leads:

a. Insert the 3-wire cable RX (red) lead into pin TB2-1 and tighten the screw.

b. Insert the 3-wire cable TX (white) lead into pin TB2-2 and tighten the screw.

c. Insert the 3-wire cable GND (green) lead into pin TB2-3 and tighten the screw.

8. Carefully plug the TB2 connector and the EMI filter board back into their sockets, and screw the EMI filter board to its standoff.

9. Reinstall the cover on the XMO2.

10. Connect the other ends of the cables to the 24 VDC power supply, the 4-20 mA input of the display device, and the serial port of the computer or terminal (see the instruction manuals for those devices for details).

A

Accessories, Optional 61
Ambient Temperature Range 60
Analog Output
  Calibration Options 21
  Changing the Range 38
  Specifications 60
Applications
  Blanketing Gases in HC Storage Tanks 65
  Formaldehyde Reactor Feed Gases 67

B

Background Gas Compensation 21
Bridge Circuit 5

C

Cable
  Entry Devices 97
  Specifications 60
Cables
  Length 8
  Signal 13
  Specifications 13
Calibration
  Analog Output Options 21
  Data Sheet 64
  Enhancing 23
  Factory Range 21
  Frequency 23
  Gases 24
  Offset 26
  One-Gas 26
  Pushbutton 26
  Required Materials 24
  RS232 Port, Initial 29
  Span Gas, Pushbutton 28
  Switches 25
  Two-Gas, Pushbutton 27
  Zero Gas, Pushbutton 28
Calibration Data Sheet 64
CE Mark Compliance 97
Changing the Analog Output Range 38
Communications Port, Setting Up 89, 90
Compensation
  Background Gas 21
  Pressure 21

D

Data Sheet, Calibration 64
Date of Publication i
Dimensions 61
Display
  Available Options 18
  Wiring 17
Document Number i
Drawings, Installation & Wiring 69

E

Edit Functions Option 94
Edit Menu 89
EMC Directive 97
EMI Filter Board 98
Enhancing Factory Calibration 23
Environmental
  Specifications 61

F

Factory Calibration
  Enhancing 23
  Range 21
Filter Board, EMI 98
Flow Rate
  Offset Gas 26
  Sample Gas 19
  Span Gas 28
  Zero Gas 28
Flow Rate, Gas 59
Flow Schematic 3

G

Gas
  Flow Rates 59
Gases
  Calibration 24
  Offset 24
  Span 24
  Zero 24

I

Installation
- Drawings . . . 69
- Sample System . . . 10
- Transmitter . . . 9

M

Materials for Calibration . . . 24
Measurement Ranges . . . 59
Menus, Edit . . . 89
Meter Settings, Changing . . . 93

O

Offset Calibration . . . 26
One-Gas Calibration . . . 26
Operating Temperature . . . 60
Ordering Information . . . 62

P

PanaView, Applications of . . . 89
Power Specifications . . . 60
Power Supply
- Description . . . 8
- Wiring . . . 17

Powering Up . . . 19
Pressure Compensation . . . 21
Pushbutton Calibration . . . 26

R

Range
- Changing . . . 38
- Factory Calibration . . . 21

Ranges, Measurement . . . 59
Return Policy . . . 105
RS232 Port
- Configuring . . . 16
- Initial Calibration . . . 29

S

Safety Warnings . . . vii
Sample Gas
- Flow Rate . . . 19
- Initiating Flow . . . 19

Sample System
- Description . . . 8
- Installation . . . 10

Signal Connections . . . 15
- CE Wiring . . . 99

Span Gas
- Calibration, Pushbutton . . . 28

Specifications
- Environmental . . . 61

Switches
- Calibration . . . 25

T

Terminal Block TB1 . . . 14
Theory of Operation . . . 3
Thermistors . . . 4
TMO2D Display . . . 8
Two-Gas Calibration
- Pushbutton . . . 27

Typographical Conventions . . . vii

U

User Responsibility . . . vii

W

Warnings, Safety . . . vii
Warranty . . . 105
Weight . . . 61
Wiring
- CE Mark Compliance . . . 97
- CE Signal Connections . . . 99
- Display . . . 17
- Drawings . . . 69
- Power Supply . . . 17
- Signal Connections . . . 15
- Terminal Block TB1 . . . 14

X

XMO2
- Accessories 61
- Cable 13
- Installation 9
- Ordering Information 62
- Overview 1
- Powering Up 19
- System Components 6
- Theory of Operation 3
- Transmitter Features 6

Z

Zero Gas
- Pushbutton Calibration 28

[no content intended for this page - proceed to next page]

Warranty

Each instrument manufactured by GE Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

[no content intended for this page - proceed to next page]

GE
Sensing

DECLARATION OF CONFORMITY

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

XMO2 Oxygen Analyzer
XMTC Thermal Conductivity Binary Gas Transmitter

to which this declaration relates, are in conformity with the following standards:

- EN 60079-0:2007
- EN 60079-1:2004
- EN50281-1-1:1998
- II 2 GD EEx d IIC T5: ISSeP02ATEX022 (ISSeP, B7340 Colfontaine, Belgium - NoBo 492)
- EN 61326-1:2006, Class A, Table 2, Industrial Locations
- EN 61010-1:2001, Over voltage Category II, Pollution Degree 2

Other standards Used:

- EN 50014:1997 +A1, A2, A3
- EN 50018:2000

following the provisions of Directives 2004/108/EC EMC and 94/9/EC ATEX.

Where products were initially assessed for compliance with the *Essential Health and Safety Requirements* of the ATEX Directive 94/9/EC using earlier harmonized standards, a subsequent review has determined that *"technical knowledge"* is unaffected by the current harmonized standards listed above.

The units listed above and any ancillary sample handling systems supplied with them do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

2009
Year of Issue

Mr. Gary Kozinski
Senior Certification Engineer

CE

TÜV USA
Member of TÜV NORD Group

GE
Sensing

ATEX COMPLIANCE

We,

GE Infrastructure Sensing, Inc.
1100 Technology Park Drive
Billerica, MA 01821-4111
U.S.A.

as the manufacturer, declare under our sole responsibility that the product

XMO2 Oxygen Transmitter

to which this document relates, in accordance with the provisions of ATEX Directive 94/9/EC Annex II, meets the following specifications:

CE 1180 Ex **II 2 GD EEx d IIC T6 or T5 (-40°C to +55°C)**
ISSeP02ATEX022 T80°C IP66

Furthermore, the following additional requirements and specifications apply to the product:

- Having been designed in accordance with EN 50014, EN 50018, and EN 50281, the product meets the fault tolerance requirements of electrical apparatus for category “d”.
- The product is an electrical apparatus and must be installed in the hazardous area in accordance with the requirements of the EC Type Examination Certificate. The installation must be carried out in accordance with all appropriate international, national and local standard codes and practices and site regulations for flameproof apparatus and in accordance with the instructions contained in the manual. Access to the circuitry must not be made during operation.
- Only trained, competent personnel may install, operate and maintain the equipment.
- The product has been designed so that the protection afforded will not be reduced due to the effects of corrosion of materials, electrical conductivity, impact strength, aging resistance or the effects of temperature variations.
- The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approved repairer.
- The product must not be subjected to mechanical or thermal stresses in excess of those permitted in the certification documentation and the instruction manual.
- The product contains no exposed parts which produce surface temperature infrared, electromagnetic ionizing, or non-electrical dangers.

Customer Support Centers

U.S.A.

The Boston Center
1100 Technology Park Drive
Billerica, MA 01821
U.S.A.
Tel: 800 833 9438 (toll-free)
978 437 1000
E-mail: sensing@ge.com

Ireland

Sensing House
Shannon Free Zone East
Shannon, County Clare
Ireland
Tel: +353 (0)61 470291
E-mail: gesensingsnnservices@ge.com

www.gesensinginspection.com

©2008 General Electric Company. All rights reserved.
Technical content subject to change without notice.

910-141 Rev. D